SOUTHERN CALIFORNIA
EDISON
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P.O. Box 5085, Rosemead, CA 91770

March 16, 2023

Mr. Michael Krause
Assistant Deputy Executive Officer
Planning, Rule Development and Implementation
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765
Email: MKrause@aqmd.gov

RE: Proposed Amended Rule 1135 – Emissions of Oxides of Nitrogen from Electricity Generating Facilities

Dear Mr. Krause:

Thank you for the opportunity to provide comments on the Proposed Amended Rule (PAR) 1135, Emissions of Oxides of Nitrogen from Electricity Generating Facilities. Southern California Edison (SCE) appreciates the South Coast Air Quality Management District's (SCAQMD) collaboration to identify solutions which consider the fuel, unique spatial, and operational constraints at SCE's Pebbly Beach Generating Station (PBGS) on Santa Catalina Island (Catalina).

SCE appreciates SCAQMD's assessment of near-zero emission (NZE) and zero-emission (ZE) technologies for Catalina. SCE supports transitioning to a low-carbon future, consistent with our Pathway 2045 vision.[1] SCE is committed to providing safe, reliable, and affordable electricity, gas, and water to Catalina's residents and over one million annual visitors while reducing emissions and maintaining environmental stewardship.

I. SCE MUST DELIVER SAFE AND RELIABLE ELECTRICITY, WATER, AND GAS UTILITY SERVICE TO CATALINA

SCE must provide safe and reliable utility services to Catalina residents, as we are the sole provider of electricity, water, and gas. Catalina's critical water and gas utility operations rely heavily on electric power production from PBGS. Without safe and reliable electricity, the residents of Catalina will experience utility service interruptions for these critical health and safety services. Catalina's electrical distribution system is a self-contained, isolated grid without connections to the mainland's system. In designing and operating the

[1] *See* Pathway 2045 | Edison International and Sustainability Report | Edison International.

generation and distribution systems, electric reliability studies must be performed to ensure safe and reliable operation of the island-wide system.

A. What is Reliability and Why is it So Important?

State law requires regulated electric utilities like SCE to provide sufficient, safe, and reliable electrical service during both normal and extreme conditions for weather and equipment availability.[2] As the operator of a remote island grid, SCE must study electrical system deficiencies and appropriately plan for future system needs to ensure any upgrades can be completed before they are needed.

To maintain power system reliability, SCE must match its electrical generation output to the electrical load (which can also be referred to as "demand"). When an imbalance between the two occurs, SCE must immediately remedy it by ramping up or down its generation sources (e.g., generators or gas turbines) to match the amount of electrical load. This concept is known as "load following." As long as generation output is able to "load follow," the system remains stable. If this cannot be achieved quickly enough, electrical demand in excess of available generation must be reduced (i.e., "load shedding") by turning off customers' power to match the amount that is available from generation sources. However, when significant discrepancies between generation and load occur this can result in the failure of the electric grid, which results in widespread outages.

The consequences of electrical system outages at Catalina can range from minor inconveniences to serious threats to public safety (such as the loss of electricity for medical facilities and emergency services, water pumping, compression for gas utility services, and sewage treatment facilities). During severe weather events, electrical outages can pose a public health risk when people are experiencing heat waves or extreme cold. These are only some of the consequences when reliable electric utility service cannot be established for the Catalina isolated microgrid.

B. How is System Reliability Measured?

Electric systems are modeled using various software tools to identify the response of the electrical grid to changes in system conditions by simulating both steady-state and transient conditions (e.g., electrical faults), as well as planned and unplanned equipment outages. The simulations are used both in real-time operations and in studying future conditions to identify necessary upgrades to prevent system interruption.

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[2] *See* Public Utilities Code § 451 ("Every public utility shall furnish and maintain such adequate, efficient, just, and reasonable service, instrumentalities, equipment, and facilities, including telephone facilities, as defined in Section 54.1 of the Civil Code, as are necessary to promote the safety, health, comfort, and convenience of its patrons, employees, and the public.").

Appropriate assessment of generation resource portfolios must be performed to incorporate all applicable operational conditions and constraints (e.g., fuel availability, maintenance, emissions, space, etc.). System reliability studies inform the electricity providers of the feasibility of various generation configurations. The studies are complex and iterative; however, absolutely necessary in evaluating various alternatives.

C. SCE's Catalina Reliability Study

In redesigning the PBGS generation and Catalina distribution system, SCE relied on a consultant, Power Engineers, to perform a series of reliability studies in multiple stages:

Stage 1: Study the feasibility of proposed generation configurations at PBGS to meet the annual and hourly peak demand using HOMER Pro® microgrid software.

Stage 2: Evaluate the configurations found viable in Stage 1 on generation frequency and voltage stability (e.g., the deviations that result from electrical faults or mismatches between generation and load). Power Engineers uses the PSCAD software program for this stage.

Stage 3: Evaluate the configurations found viable in Stage 2 with the addition of the distribution circuits that deliver power from PBGS to customers. Study the comprehensive island-wide distribution model to determine how the grid responds to the viable generation configurations from Stage 2. This stage is the most complex and includes multiple iterative steps to evaluate various factors such as frequency and voltage ride-through (i.e., the ability of the system to endure deviations), penetration of distributed energy resources, contingency conditions, etc. This stage will be conducted by Mitsubishi Electric Power Products, Inc. (MEPPI), an industry leader in power-related solutions, from generation to distribution to renewable energy.

D. Using the SCAQMD-Provided Configurations, the Proposed 2026 Facility-Wide Limit of 1.6 Tons per Year Cannot be Achieved at PBGS with the Required Level of Reliability

1. Stage 1 Study

Power Engineers used HOMER Pro software to determine whether the various PBGS generation configurations proposed by SCAQMD staff (see below) can meet all energy (kilowatt-hours) and power (kilowatts) requirements from the customers. Each generator was modeled using the manufacturer-provided maintenance schedule and 2026 demand forecast data to reflect SCAQMD's proposed facility-wide emissions limit when NZE/ZE resources are expected to be included. The demand forecast is consistent with CPUC

Decision 22-11-007 regarding the Settlement Agreement and reflects the year 2022 as the baseline load value on which the 0.5% annual growth was added.

> **Configuration 1:** Units 8 and 10 are replaced with two United States Environmental Protection Agency (U.S. EPA) Tier 4 Final (T4F)-certified engines. Unit 15 is replaced with a propane reciprocating generator. A utility-scale photovoltaic (PV) system provides approximately 30% of the island's annual GWh demand. It is assumed that Units 7, 12, and 14 are decommissioned.
>
> **Configuration 2:** Units 8 and 10 are replaced with two U.S. EPA T4F-certified engines. Unit 15 is replaced with a propane reciprocating generator. A utility-scale PV system provides approximately 30% of the island's annual GWh demand. It is assumed that Units 7, 12, and 14 are used as backup emergency generators.

The findings and results of the study are presented in the next Section. Appendix A provides detailed modeling results for Configurations 1 and 2.

SCAQMD proposed a facility-wide annual limit of 1.6 tons per year starting January 1,2026 based on a generation configuration that includes 30% of annual output from PV, 65% annual output from NZE propane-based generation, and up to 5% annual output from diesel-based generation.[3] Power Engineers' Stage 1 study demonstrates that SCAQMD's proposed generation configuration would prevent SCE from providing the required safe and reliable electricity, gas, and water utility services to Catalina residents.

The Power Engineers study concludes that neither Configurations 1 nor 2, when overlaid with SCAQMD's proposed 5% limit on diesel power production output, can feasibly ensure the island's annual and hourly demand requirements are both met. The preliminary grid reliability analysis[4] shows that in both Configurations 1 & 2, SCE would need more than half of the total annual generation output to come from diesel generators in order to meet both annual and hour demand requirements. In Configuration 1, which assumes there will be no backup generation from Units 7, 12, and 14, SCE would be unable to meet annual or hourly demand. In Configuration 2, which includes Units 7, 12, and 14 as backup, although the annual and hourly demand could be met in Scenarios 2A and 2B, more than half of annual generation output must come from diesel-based generation. Therefore, the SCAQMD's proposed 5% limit on total annual diesel generation is not achievable.

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[3] SCAQMD. Preliminary Draft Staff Report. Proposed Amended Rule 1135 – Emissions of Oxides of Nitrogen from Electric Generating Facilities. February 2023. http://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/1135/par-1135_preliminary-draft-staff-report.pdf?sfvrsn=6

[4] As explained above, Power Engineers' March 16 preliminary report is a "Stage 1"-level analysis. SCE expects the full evaluation will be completed by the other two consultants in approximately four to six months.

The challenges in meeting SCAQMD's proposed facility-wide emissions limit and its associated generation configuration are due to the constraints on propane fuel storage and delivery, safety concerns, and SCE's duty to reliably meet both annual and hourly peak demand. Because both scenarios fail to ensure reliable electric service, they would also jeopardize the safety and reliability of water and gas utility service, which cannot function without electricity.

E. The Scenario Based on 65% Propane-Based Generation Output Is Infeasible Due to Fuel Limitations

SCAQMD's proposed configuration assumes that 65% of annual generation will be provided by NZE technologies. Although SCE and Power Engineers are still evaluating the feasibility of several NZE technologies (including linear generators and fuel cells), the first Stage 1 report focuses solely on propane reciprocating generators to ensure sufficient system inertia is provided. The study concludes that relying on propane generation for 65% of the annual GWh requirement is infeasible due to fuel limitations. SCE's current propane usage for power generation is around 250,000 gallons per year; we estimate that no more than 400,000 gallons/year could be available for power generation (any more would jeopardize our ability to continue providing gas utility service to Catalina residents. The Power Engineers study shows that the maximum percentage of gross GWh that can be drawn from a propane generator is only 13%.

F. SCE Could Not Deliver Safe and Reliable Electricity, Gas, and Water Utility Services With a 5% Limit on Diesel-Based Generation Output

SCAQMD's proposed configuration would limit annual generation output from diesel-based generation to 5% or less. Power Engineers' study shows that limiting annual generation output from diesel generators would prevent PBGS from meeting either the annual or hourly demand requirements. The study shows that more than half of annual generation output must be provided by diesel-based generation. Furthermore, the study shows that at least three T4F diesel generators and backup generators are required to meet the annual and hourly demands. It is imperative to note that, although the studies show that two of the three scenarios in Configuration 2 would provide sufficient annual and hourly output, this configuration is infeasible if the 5% diesel usage constraint is imposed.

II. CONCLUSION

In summary, while SCE appreciates SCAQMD's solutions in transitioning to cleaner generation sources, the proposed configurations and emissions limit cannot be met without jeopardizing SCE's ability to safely and reliably provide electricity, water, and gas utility services to Catalina's residents and visitors. As SCE continues the effort to redesign our power generation and distribution systems for Catalina, we welcome SCAQMD's input and request for more time to continue our collaboration to ensure the island's utility needs are met.

Thank you for your consideration of SCE's comments on the PAR 1135. We look forward to continuing to collaborate with you and your staff on evaluating the best approach to maximize NOx emission reductions that appropriately balance reliability, commercial feasibility, cost, compliance deadlines, and environmental stewardship. If you have any questions or would like to discuss these issues, please contact Joy Brooks, Senior Air Quality Manager, at (626) 302-8850 or joy.s.brooks@sce.com.

Sincerely,

DocuSigned by:
Anthony Hernandez
0E235977344E47B...

Anthony Hernandez
Director of Catalina Operations & Strategy, Generation

CC: Michael Morris, SCAQMD
Belinda Huy, SCAQMD
Isabelle Shine, SCAQMD
Kenneth Borngrebe, SCE
Dawn Anaiscourt, SCE
Joy Brooks, SCE
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Matt Zents, SCE

Attachment A – Stage 1 Reliability Study Memorandum

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Attachment A
Stage 1 Reliability Study Memorandum

POWER ENGINEERS, INC.
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SUITE 700
LAKEWOOD, CO 80235 USA
PHONE 303-716-8900
FAX 303-716-8980

MEMORANDUM

DATE: March 16, 2023

TO: Matthew Zents

C: Trevor Krasowsky, Joy Brooks, Saurabh Shaw, Thomas McAuliffe

FROM: Chris Mouw

SUBJECT: 176291 Pebbly Beach Generation Station HOMER Modeling

MESSAGE

Matt,

The configuration analysis for the Pebbly Beach Generation Station (PBGS) was performed using HOMER Pro software. Configurations 1 and 2 shown below were evaluated to consider the feasibility of meeting the loading. All generators were modeled with the provided maintenance scheduling and extrapolated loading data for 2026.

Configuration Description
Configuration 1:

- Utility Scale Renewable PV System (30% of annual load)
- 2 Tier 4 Diesel Generators (Units 8 and 10)
- 1 Propane Reciprocating Engine (Unit 15)
- Existing NaS Battery System

Configuration 2:

- Utility Scale Renewable PV System (30% of annual load)
- 2 Tier 4 Diesel Generators (Units 8 and 10)
- 1 Propane Reciprocating Engine (Unit 15)
- 3 Existing Emergency Diesel Generators (Units 7, 12, and 14)
- Existing NaS Battery System

Assumptions in the model include the following:

- 25% minimum loading on the Propane Reciprocating Engines
- 10% minimum charge on the existing battery system
- Load demand forecasted data for 2026 reflecting a peak of 6 MW and approximately 31 GWh annual loading
- Existing NaS BESS modeled as 1 MW / 7 MWH with a round-trip-efficiency of 85%.
- Annual consumption of 400,000 gallons of propane
- Annual consumption of 2.2 million gallons of diesel
- No minimum spinning reserve requirement

Maintenance activities were modeled as:

- T4 and Propane Reciprocating Engine: 24 activities per year, 24 hours of down time per activity
- Emergency Diesel Generators: 1000 hours of unit operation before maintenance is required, 24 hours of down time per maintenance activity.

The Tier 4 Generators could be configured to operate in continuous operation (Prime) or operate only as-needed (Standby). Prime units operate at 1825 kW whereas Standby Units operate at 2250 kW. For each configuration, a total of zero, one, or two of the Tier 4 diesel generators were modeled as operating as a Prime to gauge the differences in fuel consumption.

The analysis revealed that all versions of Configuration 1 as well as Configuration 2 with two standby units are unfeasible. These are not feasible because the combination of generation assets and load demand resulted in a system which would fail to meet the loading needs at one or multiple times during the year. If this Configuration was pursued for PBGS, it is probable that loadshedding would be necessary at times. It is noted that these configurations should not be pursued. Please find the results for Configuration 2 from the HOMER study in the table below. Figures 1 through 3 show the electrical demand and fuel consumption of propane and diesel for Configuration 2 respectively and Figure 3 shows the error message generated by HOMER when a scenario is unfeasible.

Table 1: Comparison of generation configurations

Configuration 1				
Not feasible for all versions				
Configuration 2				
2A: Units 8 and 10 Prime				
Solar PV Summary		Penetration	30.3%	Load Served
Propane Reciprocating Engine Summary	383,215	Gallons of propane	13%	Load Served
Emergency Diesel Summary	176,401	Gallons of diesel	2.6%	Load Served
Tier 4 Units Summary	1,251,253	Gallons of diesel	53.9%	Load Served
2B: Unit 8 Prime and Unit 10 Standby				
Solar PV Summary		Penetration	30.3%	Load Served
Propane Reciprocating Engine Summary	346,769	Gallons of propane	11.5%	Load Served
Emergency Diesel Summary	176,401	Gallons of diesel	4%	Load Served
Tier 4 Units Summary	1,222,912	Gallons of diesel	54%	Load Served
2C: Unit 8 & 10 Standby				
Not feasible				

ıction	kWh/yr	%
ric flat plate PV	9,666,594	30.4
nins 1825kW T4F Prime Unit 8	10,902,495	34.3
gency Deisel Generators Unit 12	6,750	0.02
nins 1825kW T4F Prime Unit 10	6,238,286	19.6
ane Reciprocating Engine	4,143,469	13.0
gency Deisel Generators Unit 7	762,300	2.40
gency Deisel Generators Unit 14	50,400	0.15

Consumption	kWh/yr	%
AC Primary Load	31,090,545	100
DC Primary Load	0	0
Deferrable Load	0	0
Total	31,090,545	100

Quantity	kWh/yr	%
Excess Electricity	414,341	1.30
Unmet Electric Load	0	0
Capacity Shortage	0	0

Quantity	Value	Units
Renewable Fraction	28.9	%
Max. Renew. Penetration	178	%

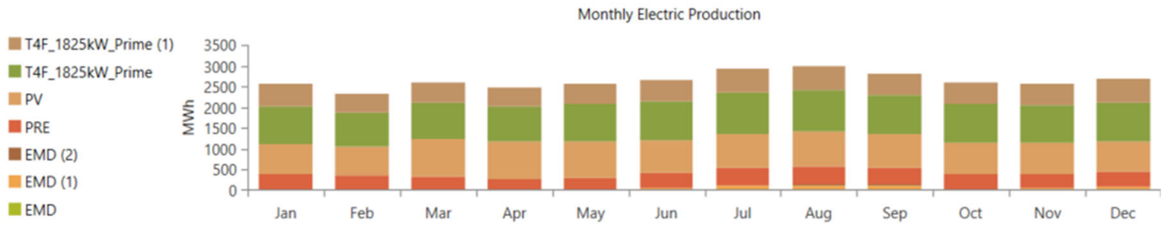


Figure 1: Electrical demand for Configuration 2

Propane (LP) Liquid

Quantity	Value	Units
Total fuel consumed	1,432,052	L
Avg fuel per day	3,923	L/day
Avg fuel per hour	163	L/hour

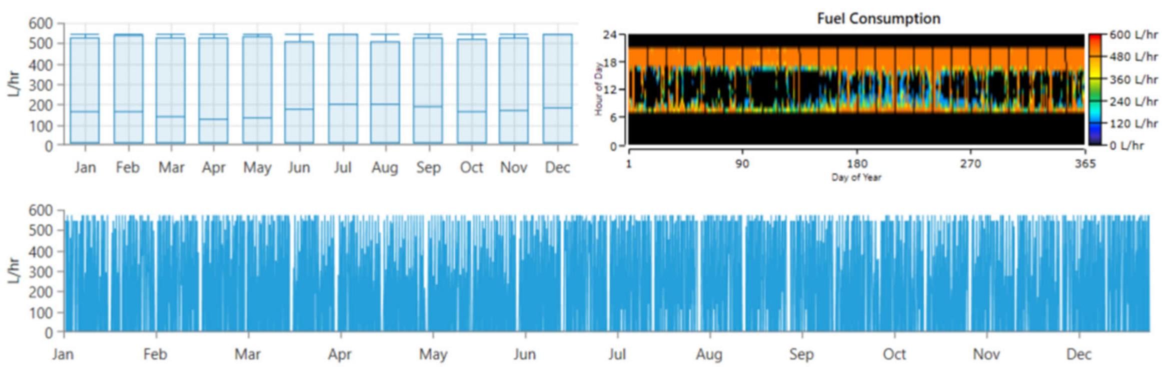


Figure 2: Propane fuel consumption for Configuration 2

Diesel

Quantity	Value	Units
Total fuel consumed	5,264,548	L
Avg fuel per day	14,423	L/day
Avg fuel per hour	601	L/hour

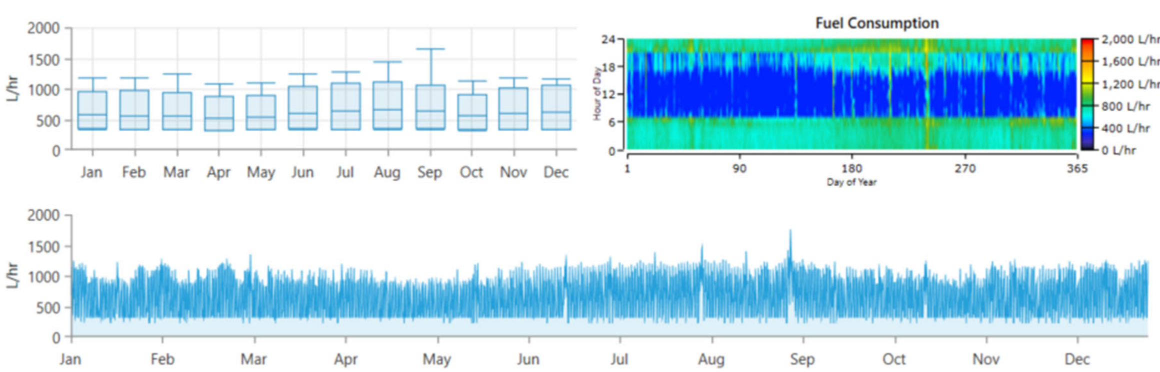


Figure 3: Diesel fuel consumption for Configuration 2

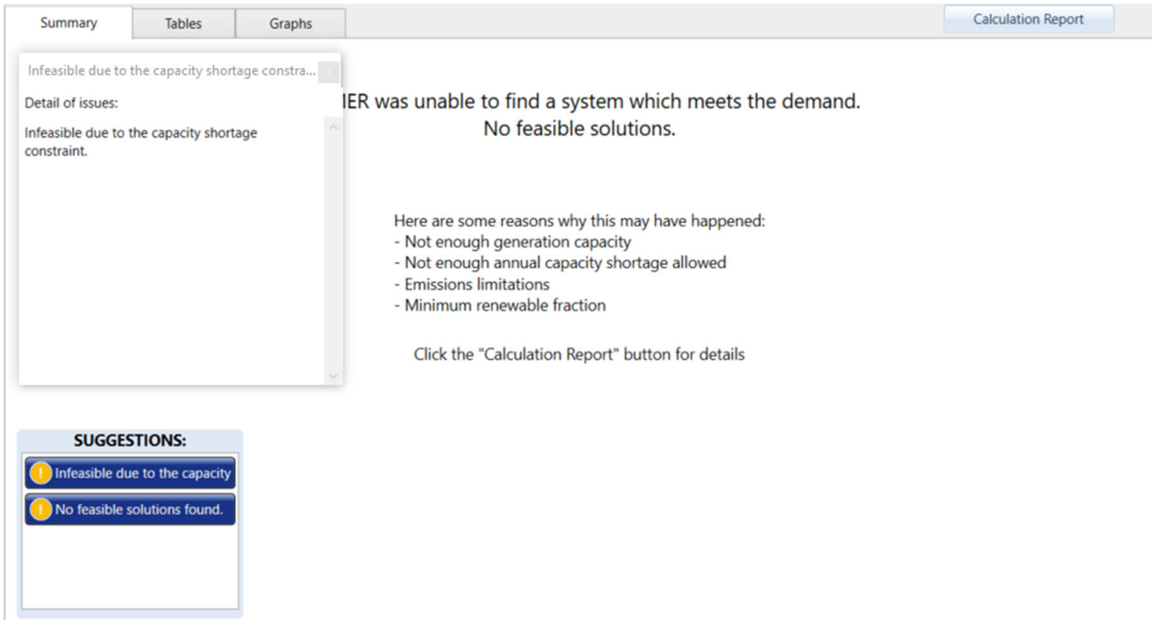
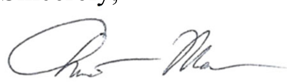


Figure 4: Error message generated upon configuration failure

Thank you for the opportunity to work on this study. I look forward to discussing these results with you and your team. Please reach out to me if there are any questions.

Sincerely,



Chris Mouw, P.E. (CO)
Project Engineer & Area Lead