FILED
11/25/25
04:59 PM
R2106017

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Modernize the Electric Grid for a High Distributed Energy Resources Future.	Rulemaking 21-06-017

PACIFIC GAS AND ELECTRIC COMPANY'S (U 39 E) RESPONSE TO ASSIGNED COMMISSIONER'S RULING SEEKING ADDITIONAL INFORMATION ON DER ENABLED NEAR TERM FLEXIBLE CONNECTIONS

BENJAMIN C. ELLIS

Pacific Gas and Electric Company
300 Lakeside Drive, Suite 210
Oakland, CA 94612
Telephone: (415) 265-2678
E-Mail: Ben.Ellis@pge.com

Attorney for
PACIFIC GAS AND ELECTRIC COMPANY

Dated: November 25, 2025

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Modernize the Electric Grid for a High Distributed Energy Resources Future.	Rulemaking 21-06-017

PACIFIC GAS AND ELECTRIC COMPANY'S (U 39 E) RESPONSE TO ASSIGNED COMMISSIONER'S RULING SEEKING ADDITIONAL INFORMATION ON DER ENABLED NEAR TERM FLEXIBLE CONNECTIONS

Pursuant to the *Assigned Commissioner's Ruling Seeking Additional Information on DER Enabled Near Term Flexible Connections* (ACR), filed November 3, 2025, and the Administrative Law Judge's (ALJ) *Email Ruling Response to UCAN's Request for Clarification* (Ruling), filed November 14, 2025, Pacific Gas and Electric Company (PG&E) provides its responses to questions 1 through 19, 21, and 22 as posed in the ACR.

I. PG&E RESPONSES TO QUESTIONS REGARDING ADMS/DERMS CAPABILITIES THAT UNLOCK NON-FIRM CAPACITY FOR POLYPHASE CUSTOMERS

1. Are IOU ADMS and DERMS currently capable of providing short-term (e.g., day-ahead or week-ahead) load and generation capacity forecasts suitable for variable operating envelopes for all locations on the polyphase distribution grid?

PG&E's DERMS system is currently capable of providing short-term load and generation capacity forecasts suitable for variable operating envelopes under the following conditions:

- Forecasts are generated in hourly intervals up to 90-hours ahead.
- Forecasts are generated today only at points with existing SCADA measurements (e.g. Substation Bank transformer or Feeder-head circuit-breaker).

///

///

///

a. If ADMS and DERMS are currently capable of providing short-term forecasts for variable operating envelopes, what is the maximum number of locations that can be forecast at the normal duration (e.g., day-ahead or week-ahead) with the current or planned level of resources?

Forecasts are currently generated only for the set of feeders (and specific SCADA-measured locations) where PG&E and PG&E's DERMS vendor have explicitly modeled the feeder and tuned a forecast for the feeder. As of Nov 3, 2025, there are currently 37 feeders modeled in PG&E DERMS having forecasts tuned for them. If PG&E's 2027 GRC funding related to DERMS is approved, PG&E plans to be able to perform forecasting on 250 feeders via load flow and state estimation in addition to over 100 feeders without state-estimation enabled on them (those feeders would only have forecasts for explicitly defined SCADA points).

b. For ADMS and DERMS that are not currently capable of providing short-term forecasts, what other systems or manual processes have been used (e.g., in research projects, pilots, or demonstrations) to provide this capability?

c. For ADMS and DERMS that are not currently capable of providing short-term forecasts, what is the planned timeline for developing this capability? Please note if this timeline differs from the timeline presented in the most recent IOU filing (e.g., Operational Flexibility or Bridging report, GRC work paper, etc.).

2. Are IOU ADMS and DERMS currently capable of rapidly providing load and generation forecasts suitable for dynamic operating envelopes (e.g., hour ahead values) for all locations on the polyphase distribution grid?

PG&E's DERMS system currently generates a "short-term" forecast every 24 hours that is used to automatically send out day-ahead operating limits. PG&E's DERMS system also currently generates a "near-term" forecast every 4 hours that could be used for non-day ahead manual dispatches (although this is generally not used). Although the capabilities exist within the PG&E DERMS to change the settings to retrigger the "near-term" forecast hourly, there are extra compute and cost resources required that at this time does not serve a PG&E use case.

Additionally, PG&E's DERMS system currently sends near-real-time updates to operating envelopes during periods of unforeseen grid events such as power outages,

communications failures, or abnormal switching. However, this functionality uses near real-time data from SCADA, not forecasting capabilities.

a. If ADMS and DERMS are currently capable of rapidly providing forecasts suitable for dynamic operating envelopes, what is the maximum number of locations that can be forecast at the normal duration (e.g., hour ahead) with the current or planned level of resources?

As mentioned in the answer to question 1, these forecasts are currently generated only for the set of feeders (and specific SCADA-measured locations) where PG&E and PG&E's DERMS vendor have explicitly modeled the feeder and tuned a forecast for the feeder. As of Nov 3, 2025, there are currently 37 feeders in PG&E's DERMS with tuned forecasts. If PG&E's 2027 GRC funding related to DERMS is approved, PG&E plans to be able to perform forecasting on 250 feeders via load flow and state estimation in addition to over 100 feeders without state-estimation enabled on them (those feeders would only have forecasts for explicitly defined SCADA points).

b. For ADMS and DERMS that are not currently capable of rapidly providing short-term forecasts suitable for dynamic operating envelopes, what is the planned timeline for developing this capability? Please note if this timeline differs from the timeline presented in the most recent IOU filing (e.g., Operational Flexibility or Bridging report, GRC work paper, etc.).

Currently, PG&E DERMS does not forecast at "all locations on the polyphase grid." PG&E DERMS currently uses a measurement-based forecast that only looks at locations that have SCADA values (e.g., Substation Transformer Bank, Feeder Head, Distribution Recloser). These are generally the locations that have a constraint that needs to be addressed. To be able to forecast at "all locations" PG&E DERMS would need to implement a model-based (load flow) forecast that estimates forecasts across the system. This is currently being evaluated as part of the ADMS program.

The ADMS load forecasting functionality heavily depends on the Load Flow / State Estimation (LFSE) function within the ADMS. The pilot phase of LFSE functionality was tested on 56 feeders. PG&E has confirmed the core functionality of the Schneider Electric LFSE

software product and verified that the LFSE solution can be successfully implemented on live feeders and meet PG&E's operational and business needs. PG&E's LFSE pilot achieved its goal of consistently producing estimated voltage, power, and current values close to observed SCADA measurements at all locations on the pilot circuits in a manner resilient to frequent topology changes on these circuits. Building on this success, PG&E is requesting in the GRC 2027 to expand the ADMS forecasting capability, leveraging the LFSE solution as its foundation.

3. Please articulate with specificity, as needed, any additional functionalities that must be developed for ADMS and DERMS to be capable of providing short-term load and generation capacity forecasts to all customers located on the polyphase grid of the Large IOUs.

PG&E's ADMS and DERMS systems do not currently include the functionality required to generate and dispatch short-term capacity forecasts to all customers located on the polyphase grid. Doing so would require each feeder to be modeled in DERMS and to have a Load Flow / State Estimation model built and tuned, since many customers' capacities are limited by non-measured grid constraints (e.g. distribution line sections).

a. If needed, please articulate with specificity any planned or anticipated resources that will be required for these additional ADMS and DERMS functionalities.

PG&E plans to have this capability for 250 of the ~3,200 feeders completed by the end of 2030, as stated in our 2027 GRC proposal.

Additionally, in order for customers to be able to receive and act upon the provided capacity forecasts, additional equipment (and commissioning) would need to be done individually for each customer site.

///

///

///

4. With the understanding that the Large IOUs are at different stages of implementing their ADMS and DERMS capabilities, how can the Commission ensure that near-term solutions are provided to customers in a timely fashion?

PG&E already offers static variable (e.g. hourly, seasonal, etc.) limits via the Load Limit Letter process. PG&E does not have insight into the other IOU's timelines for implementation of solutions. However, PG&E took a staged approach, with PG&E first offering Load Limit Letters that allowed customers to have more capacity than a single static year-round limit, but did not need the complexity of a DERMS and communication system for more dynamic limits. While PG&E already offers this solution, other IOUs who do not offer it would need to have a planning process to be able to determine a method to offer a static variable limit.

a. Please provide an estimated timeline for how long it would take to implement these solutions.

5. If needed, what solutions should the Large IOU(s) at an earlier stage of ADMS/DERMS capabilities employ as interim measures as their ADMS/DERMS capabilities are building up?

PG&E does not have insight into the other IOUs timelines for implementation of solutions. However, PG&E took a staged approach, with PG&E first offering static variable limits via the Load Limit Letter. This allowed customers to have more capacity than a single static year-round limit, but did not need the complexity of a DERMS and communication system for more dynamic limits. PG&E then went beyond that offering to now provide the Flex Connect Program for customers who desire more flexibility than the Load Limit Letters offer, but it requires a communication system and DERMS.

a. Please provide an estimated timeline for how long it would take to implement these solutions.

///

///

///

6. Is there a limitation on the number of customers that can be provided day ahead variable operating envelopes (based on these short-term forecasts) through the Large IOUs' IEEE 2030.5 communications servers?

PG&E's current 2030.5 communication server can handle thousands of customer connections. It may be possible to further increase the number of connections by scaling our vendor's cloud infrastructure, but further investigation would be needed to understand the cost and timeline to do so.

7. Is there a limitation on the number of customers that can be provided dynamic operating envelopes (based on an assumption of hour ahead forecasts) through the Large IOUs' IEEE 2030.5 communications servers?

Please see Response to Question 6.

8. Are there any communication functionalities required to provide variable or dynamic operating envelopes to customers on the polyphase electric grid that are not provided by the IOU CSIP/IEEE 2030.5 infrastructure?

There are no additional PG&E DERMS communication functionalities required outside of the 2030.5 infrastructure. However, in order for customers to be able to receive and act upon the provided capacity forecasts, additional customer-owned equipment (and commissioning) would need to be done individually for each customer site.

9. Please detail with specificity any plans, including projected timelines, to bring down the customer cost to receive variable or dynamic operating envelopes via direct communications with IOU IEEE 2030.5 servers.

PG&E's current plan to reduce customer costs is centered on bootstrapping a robust and competitive ecosystem of vendors that can provide the necessary 2030.5 communication solutions to customers. To that end PG&E is currently supporting work by multiple software vendors in the Electric Vehicle charge management software sector. We anticipate that (in addition to the 2 currently certified vendors) at least 3 additional vendors will complete interoperability testing by mid 2026.

///

///

10. Are there any existing arrangements with aggregators that would allow those aggregators to coordinate the response of multiple customers?

Yes. PG&E currently has two third-party vendors ("aggregators") that have completed interoperability testing with our DERMS and are able to coordinate the responses of multiple customers and sites.

11. Please detail with specificity any plans, including projected timelines, for IOUs to enter into agreements with aggregators that would reduce the per customer cost to receive variable or dynamic operating envelope data from IOU ADMS and DERMS.

In order to bootstrap a robust and competitive ecosystem of 2030.5 communication vendors, PG&E has agreed to cover interoperability testing costs for new vendors that complete interoperability testing by mid 2026 with the goal of reducing the per customer costs to participate in Flex Connect.

12. Please detail with specificity the level of data that is provided to Community Choice Aggregators about large customers within your service territory.

CCAs are provided customer data in order to bill the customers for their energy usage. They are given meter and billing data on a monthly basis.

13. Should Rules, Tariffs, or policies be modified in order to allow for the implementation of variable or dynamic operational envelopes for customers on the polyphase grid?

No.

a. If yes, please provide suggestions regarding the specific Rules, Tariffs, or policies, and any suggested modifications.

b. If no, what Commission guidance and IOU action is needed in order to implement variable or dynamic operational envelopes?

PG&E believes that variable and dynamic operational envelopes are currently allowed as a part of customer interconnection under existing Rules and Tariffs.

PG&E's understanding is that implementing variable and dynamic operational envelopes requires the IOU to invest in an ADMS or DERMS system that can generate short-term forecasts

and dispatch limits based on these forecasts to customers. PG&E has already implemented such a system and is currently using variable operational envelopes for multiple live sites.

II. PG&E RESPONSES TO QUESTIONS REGARDING DIRECTED MAXIMUM CAPACITY VALUES DURING ABNORMAL GRID OPERATION

14. Please estimate the annual number of abnormal grid operations due to emergent situations which utilize operational flexibility actions such as switching or curtailment to ensure reliable operation.

By analyzing 2025 year-to-date (approximately 10 months of data) metrics across the 5 feeders with current DERMS Control Sites we see an average of 1.2 unplanned switching events per feeder.

15. Please estimate the annual number of abnormal grid operations due to planned events which require utilize operational flexibility actions such as switching or curtailment to ensure reliable operation.

By analyzing 2025 year-to-date (approximately 10 months of data) metrics across the 5 feeders with current DERMS Control Sites we see an average of 3.6 planned switching events per feeder.

16. Does the value provided by the ability to signal maximum import values via IEEE 2030.5 to sites on the polyphase grid during emergent abnormal grid operation justify the technical and contractual effort necessary to develop this ability?

Yes.

a. How could such customer import direction be developed and implemented to maximize value and produce significant net benefit to the system?

PG&E believes that the ability to signal import limits during emergent abnormal grid operations is required in order to safely operate a variable or dynamic operating envelope scheme, and doing so via 2030.5 is more cost-effective than other protocols or implementations. However, in order to maximize value and net benefits, it is important to implement such

functionality only where necessary (*e.g.*, only on feeders that have sites operating under such envelopes).

17. Does the value of the system provided by the ability to signal maximum import values via IEEE 2030.5 to sites on the polyphase grid in anticipation of potential or planned abnormal grid operation justify the technical and contractual effort necessary to develop this ability?

Yes. PG&E believes that the ability to signal import limits in anticipation of potential or planned abnormal grid operations is required in order to safely operate a variable or dynamic operating envelope scheme. Without this ability there would need to be significant manual effort (including the operational and safety risks associated with manual tasks) required to manage the limit settings of connected sites as part of potential or planned abnormal grid operation work.

18. Should Rules, Tariffs, or policies be modified in order to allow for operator signaled maximum import capacity limits under abnormal grid operation?

Yes.

a. If yes, please provide suggestions regarding the specific Rules, Tariffs, or policies, and any suggested modifications.

For sites that have opted into DERMS-connected programs (e.g. PG&E Flex Connect), PG&E believes that this ability for operator-signaled max capacity limits is already possible under existing Rules and Tariffs.

The Commission may want to consider updates to Rules or Tariffs (for particular customer classes that are known to be flexible and are large enough to have meaningful grid impact) to require connection with the IOU's DERMS that would allow IOU operators to signal maximum capacity limits during abnormal grid operations. Such a requirement (and adoption at scale) could allow for increased reliability (via increased operational flexibility). Additionally, such a requirement (e.g. requiring DERMS-connected flexible interconnections as part of Rule 29) could allow the IOU to energize customers faster and to increase asset utilization (which drives down rates).

b. If no, what Commission guidance and IOU action is needed in order to allow for operator signaled maximum import and export capacity limits under abnormal grid operations?

c. Please describe what implementation considerations may differ between signaled response to emergent abnormal conditions and operating envelope adjustment in response to planned abnormal conditions.

In terms of implementation considerations, different functionality and integrations may be required to support each of those use cases. For example:

- Support for emergent abnormal conditions requires an integration between the ADMS system's real-time network model (where real-time grid conditions are monitored) and the DERMS system (where operating envelopes are created and dispatched).
- Support for planned abnormal conditions requires an integration between the IOU's source of planned switching (which is a separate ADMS module and separate release schedule for PG&E) and the DERMS system.

III. PG&E RESPONSES TO QUESTIONS REGARDING FLEXIBLE CAPACITY FOR SINGLE PHASE FEEDER CUSTOMERS

19. Approximately what portion, in quartiles (e.g., 0-25%, 25- 50%) of the Large IOU single phase customers have their service infrastructure modeled in power flow software?

PG&E generally does not incorporate service infrastructure into its standard power flow software models. For both single-phase and three-phase customers on PG&E's secondary low voltage distribution system, transformers may be represented in certain versions of the power flow model for specific analyses; however, these transformer models are not typically utilized within the Distribution Planning Process.

PG&E's distribution operations applications (ADMS and DERMS) modeling extends up to the service location for primary (medium-voltage) systems and up to the service transformer for secondary (low-voltage) systems. In the case of meshed networks—limited to a handful of substations in the San Francisco area—the model includes more granular detail, capturing both single-phase and three-phase customer connections.

21. Are there any existing plans to expand ADMS and DERMS load and generation forecasting capabilities to single phase customers?

Yes.

a. If yes, please detail these plans.

In 2026-2027 PG&E plans to augment its DERMS system to include the ability to forecast and dispatch capacity envelopes at the secondary transformer level to aggregators that will then manage single-phase customer loads (e.g. via a residential EV managed charging program).

That said, PG&E does not currently have plans to use centralized forecasting and dispatching (e.g. from a DERMS) to single-phase customers for the following reasons:

- Single-phase service connections are not currently modeled in PG&E's ADMS and DERMS systems. Doing so would require significant financial and resource investment and is not currently planned.
- Direct connections between single-phase customers and PG&E's DERMS are currently cost prohibitive (on the order of tens of thousands of dollars)
- Controlling single-phase customer loads should be done as close partnership with the customer in which the customer has clear information and control. This requires significant additional functionality which is outside the scope of PG&E's current DERMS implementation (e.g. residential customer facing user experience portals, handling of residential user preferences for load management)

b. If no, what is the reason for not pursuing inclusion of these portions of the grid?

22. Is there a lower cost communication pathway that can be leveraged to provide lower frequency and longer response time communication of short-term profile values to DER customers taking single phase service?

PG&E is exploring a pathway to enable this via AMI 2.0 meters and edge computing. See the response to question 24 for more details.

IV. CONCLUSION

PG&E appreciates the opportunity to provide these responses to the questions posed in the ACR. PG&E looks forward to continuing to review these responses with the Commission and Stakeholders.

Respectfully Submitted,

BENJAMIN C. ELLIS

By: */s/ Benjamin C. Ellis*
BENJAMIN C. ELLIS

Pacific Gas and Electric Company
300 Lakeside Drive, Suite 210
Oakland, CA 94612
Telephone: (415) 265-2678
E-Mail: ben.ellis@pge.com

Attorney for

Dated: November 25, 2025

PACIFIC GAS AND ELECTRIC COMPANY