EARLY OPINION REQUEST INFORMATION

The information provided in this request form will be used to request an Early Opinion (EO) from CPUC staff.

Program Administrator (PA) may request an EO review on projects in the development stage that are not ready for full project review. EO requests may include any aspect of project development, such as policy questions, appropriate baseline, calculation techniques, preponderance of evidence documentation, program influence, and so on. EO requests may reference a specific project or cover issues relevant to multiple projects.

EO requests must first clearly state the issue(s) or the policy 'gray area', followed by a set of specific clarifying questions. The PA is also expected to provide opinions/thoughts on the 'gray-area' issue(s) for the CPUC Staff to consider.

INSTRUCTIONS

All fields with an asterisk (*) are mandatory to submit the form.

Any tables containing Personally Identifiable Information (PII) should be flagged by checking the box at the top of each section of the form. Any fields containing PII will be flagged for confidentiality.

To add rows, click the ⊞ that appears after clicking in the cell with the light blue shading).

4) Additional Contact			

EARLY OPINION INFORMATION	
EO Title*	Non-DEER EUL for Pump Overhaul
EO Tracking Number*	EO-49
CPUC EO Reviewers	DNV ([redacted])

EO REQUESTOR			
Add more rows as needed by clicking the [+] that appears after clicking in the cell with the light blue shading			
PA / Third Party Implementer*	[redacted]		
Joint PA EO*	No		
	Name, Title	**Telephone #**	**Email**
1) Primary PA Contact*	[redacted]	[redacted]	[redacted]
2) Additional PA Contact			
3) Additional PA Contact			
4) Additional PA Contact			
Program Name(s)	SW WISE™ – Statewide Water Infrastructure System Efficiency™ Program Program ID - SCE_SW_WP		

EO SCOPE	
Please do not include any PII in this section	
Describe the types of business impacted.* Is the proposed set of measures applicable to any of the following business types? ☐ Small-and Medium-Sized Businesses (SMBs) ☒ Hard-to-Reach (HTR) ☒ Disadvantaged Communities (DACs)	
Estimate the size of the incentive per project associated with a project subject to the EO review:* **NA or unknown, this EO does not impact incentives for this program.**	
EO Category(s)*	☐ Policy ☐ Measure Performance ☐ Program Influence ☐ Baseline ☐ Measure Application Type ☐ Savings Reporting ☒ EUL/RUL ☐ Measure Cost ☐ M&V Boundaries ☐ Incentive ☐ Documentation Requirements ☐ Fuel Substitution ☐ Equity ☐ Calculation Technique ☐ Other, please specify: Click or tap here to enter text.
Savings category	Both (electric and therms)
Project Type	Custom
Measure Description	Measure involves overhauling a pump to restore efficiency to its original OEM specifications, or rightsizing based on trimmed impeller or added/removed stages
Industry/Market Sector*	☐ Residential ☒ Commercial ☒ Industrial ☒ Agricultural ☐ Cross cutting ☒ Other (describe) Water & Wastewater Agencies/ Water Districts / Special Districts

DATE TRACKING			
Add more rows as needed by clicking the ⊞ that appears after clicking in the cell with the light blue shading			
PA Submission Date*	May 18, 2026		
Is this an urgent request?*	No		
Revision number	**Summary and Location of Updates**	**CPUC or PA?**	**Date**
Revision 1	CPUC staff response to PA with clarifying questions.	CPUC	6/3/2026
Revision 2	[redacted] responded with additional details	PA	6/10/2026
Revision 3	[redacted]	PA	7/2/2026
Revision 4	Comments from CPUC regarding degradation analysis	CPUC	7/16/2026
Revision 5	[redacted]	PA	7/21/2026
Revision 6	Additional comments from CPUC regrading updated degradation analysis	CPUC	7/27/2026
Revision 7	[redacted]	PA	7/29/2026
Revision 8	CPUC staff response to EO-49	CPUC	8/3/2026
Revision 9	[redacted] up discussion regarding EUL in CPUC staff response EO-49	CPUC	8/13/2026
Revision 10	CPUC staff proposes interim EUL held during CPR call	CPUC	8/27/2026
Revision 11	CPUC staff issues conclusion to EO-49	CPUC	9/3/2026
Completion Date	September 3, 2026		
Posting Date	September 3, 2026		

EO QUESTIONS

1. EO QUESTION

To add another response row, click the ⊞ that appears after clicking in the cell with the light blue shading. To add another EO question table, click the ⊞ that appears at the bottom of this table.

Does this table contain PII?* ☐ Yes ☒ No

Problem Statement* *The [redacted] program seeks EO on approving a conservative EUL of 9 years for Pump Overhauls per the below justification. Please see the table below from the Pump Overhaul EUL Analysis.xls attached with this EO.*

Pump Overhaul EUL

	Pre-OPE	Post OPE	Average degradation rate	Number of pumps used in computing degradation	EUL
Centrifugal Booster	43.09	62.91	1.81	604	11
Submersible Booster	41.73	60.33	1.21	181	15
Submersible Well	35.99	54.83	2.22	458	9
Turbine Booster	50.13	69.98	1.82	1176	11
Turbine Well	46.08	65.34	2.02	1701	10

May 18, 2026

Background* ***PA Opinion/Proposed Response to EO Question 1. (must be filled in)***

Per the EE Policy Manual V6 April 2020, "[if] DEER values and methods are not available, the IOUs, RENs and CCAs may propose new values for [CPUC] staff review and approval". Furthermore, per section 4.2 of the Statewide Custom Guidance Document (version 1.4 effective 6/3/2021), non-DEER EUL's are allowed so long as they are cited.

Justification for New EUL

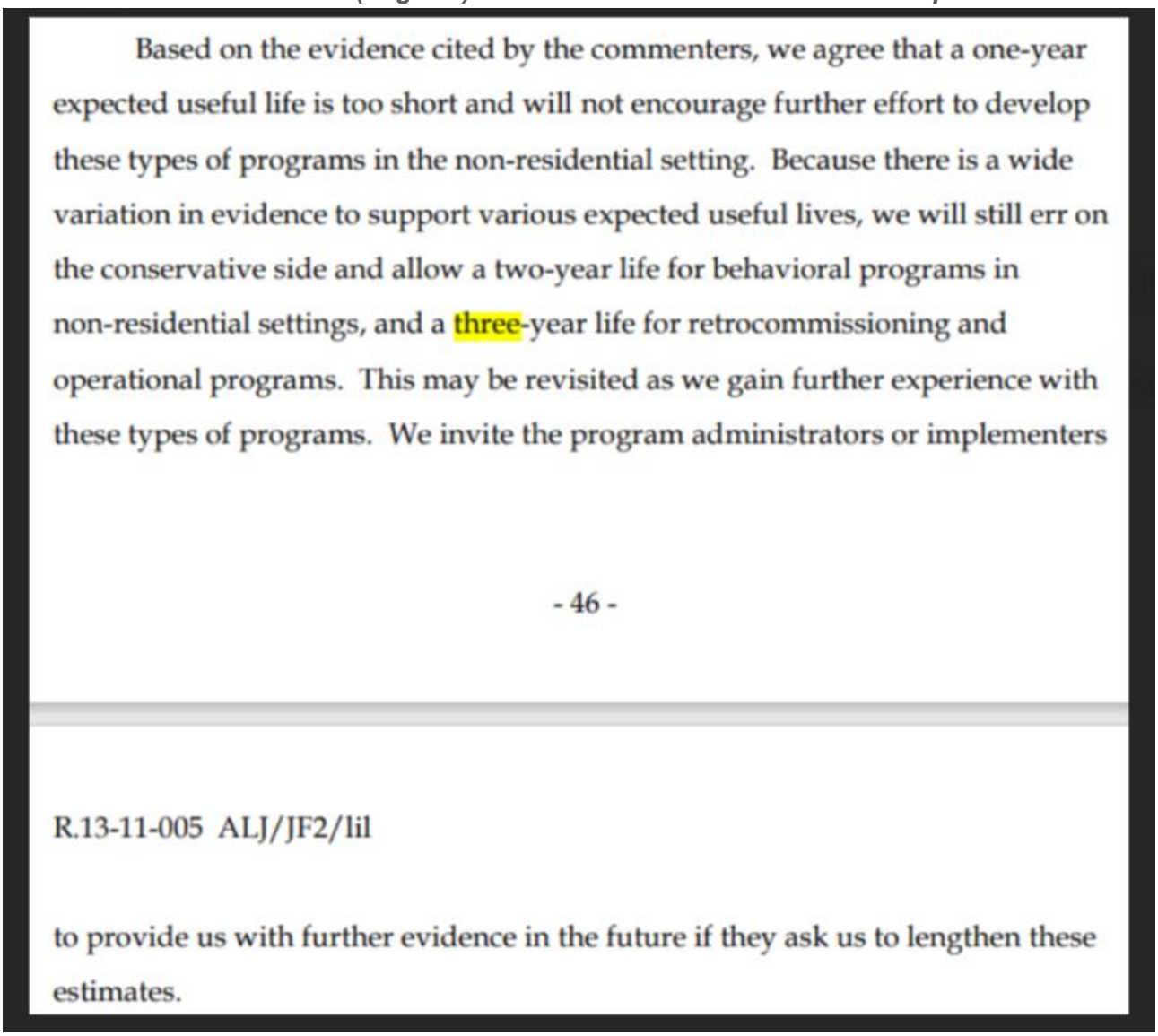
The default EUL for BRO measures is 3 years pursuant to CPUC Decision D.16-08-019. However, the pump overhaul measures differs materially from typical BRO measures and therefore warrants consideration of a project-specific EUL supported by engineering justification and documented evidence. Unlike standard BRO measures that primarily involve maintenance or operational adjustments that drift back to the base case operation after a short period, pump overhaul involves mechanical rehabilitation of critical pump components, including replacement of bowl assembly, impellers, bearings, seals, and wear rings depending on each specific case. These actions restore hydraulic performance, improve operating efficiency, and extend the period over which the pump can continue to operate at improved performance before another overhaul is required. As such, the persistence of the resulting energy savings is expected to extend beyond the default 3-year EUL applicable to typical BRO measures.

CPUC policy allows non-default EUL values where the default assumption is not appropriate and where sufficient technical support is provided. The Energy Efficiency Policy Manual, Version 6 (April 2020) states that when DEER values or methods are unavailable or not applicable, Program Administrators

may propose alternative values for CPUC staff review and approval. Similarly, Section 4.2 of the Statewide Custom Project Guidance Document, Version 1.4 (effective June 3, 2021) allows the use of non-DEER EUL values provided they are supported by documented sources or technical justification.

As stated in CPUC guidance related to EO-39, where a custom EUL was approved for the [redacted], when claiming a useful life different from default assumptions, documentation demonstrating a preponderance of evidence (POE) is required, which may include maintenance records, failure rates, operational history, or other engineering analyses.
Further support for this approach is provided in CPUC Decision D.16-08-019, which establishes the framework for BRO measures and recognizes that measure life assumptions may need to be updated when supported by new data and technical evidence.

CPUC Decision D.16-08-019 (Page 46)- Refer to file- "Decision D.16-08-019.pdf"



Based on the evidence cited by the commenters, we agree that a one-year expected useful life is too short and will not encourage further effort to develop these types of programs in the non-residential setting. Because there is a wide variation in evidence to support various expected useful lives, we will still err on the conservative side and allow a two-year life for behavioral programs in non-residential settings, and a three-year life for retrocommissioning and operational programs. This may be revisited as we gain further experience with these types of programs. We invite the program administrators or implementers

- 46 -

R.13-11-005 ALJ/JF2/lil

to provide us with further evidence in the future if they ask us to lengthen these estimates.

Figure 3: CPUC's direction on EUL for BRO measure

Consistent with this Decision and to provide further evidence, a data-driven analysis was performed to estimate a representative EUL for pump overhaul measure. The analysis used a database of historical pump test records spanning approximately nine years, comprising multiple performance test results for same pumping stations. T These records provide an empirical basis to evaluate efficiency degradation as pumps operate under normal wear conditions.

For each pump type, the rate of efficiency degradation was calculated based on the observed change in pump performance between successive test events. The degradation rate was then used to estimate the time required for the pump to return to a degraded operating condition that would typically trigger a subsequent overhaul. This threshold varies by pump type but generally falls within the range of approximately 35% to 46% of OPE. **By linking the estimated EUL directly to observed degradation cycles derived from field data, this approach provides a measure-relevant and empirically supported basis for determining EUL, rather than relying on generalized or default assumptions.**

Data -Driven Methodology for EUL Determination

To estimate a representative EUL, a data-driven analysis was conducted using historical pump performance test records. The dataset consists of more than 3,000 pump test records collected between 2016 and 2024 from the [redacted]. These records include multiple test results for individual pumps over time, enabling direct observation of efficiency degradation by pump type under normal operating conditions. Please see the Pump Overhaul EUL Analysis.xls attached with this EO for reference of this analysis.

Please note, there are additional programs with valuable data on pump testing in California, such as [redacted]. However, the other databases were not available for this analysis, and the SCE pump test database was found to be sufficient.

Identification of Overhaul Events

As a first step, the pump test records were assessed to identify likely pump overhaul events. When two records corresponding to the same pump reference showed an increase in OPE greater than [redacted] percent points, the event was assumed to indicate a pump overhaul event. This threshold is considered reasonable as such performance improvements typically result from significant mechanical intervention consistent with pump overhaul activities. These records were used to establish representative Pre-OPE and Post-OPE values for each pump category.

Please note, an indication of a pump overhaul event can also indicate a full pump replacement. However, pump replacements are not typical, unless there is a major change in service level or the motor is also past its effective useful life of 15-20 years. Consequently, this most likely accounts for only a minor fraction of the population. Additionally, this does not affect the degradation rate established in this analysis, since the primary wear-related losses are linked to the bowl components within the pump system.

Estimation of Degradation Rate

For each pump with multiple test records, the degradation in performance between test events was

calculated as:

Change in OPE:

$$\Delta OPE = OPE_1 - OPE_2$$

where the difference represents the reduction in pump efficiency between the two test dates.

The annual degradation rate was calculated by dividing the OPE change by the number of years between the two successive test events:

$$\text{Annual Degradation Rate (\%/year)} = \frac{OPE_1 - OPE_2}{\text{Years Between Tests}}$$

The analysis was performed for each Pump Reference Number within the same pump type and horsepower (HP)range to ensure that degradation behavior was evaluated across comparable equipment categories. Please note, the Pump Reference Number is a tracking number assigned to each unique pump system as part of [redacted]. The resulting degradation values were aggregated to determine an average annual degradation rate for each pump type across all applicable HP ranges. To improve robustness, degradation rates were filtered to exclude outliers by limiting the dataset to values within the 10th and 90th percentiles for each pump category.

Estimation of EUL

The EUL of the pump overhaul measure was calculated based on the observed efficiency improvement resulting from overhaul and the corresponding degradation rate:

$$EUL = \frac{(Post\text{-}OPE - Pre\text{-}OPE)}{\text{Average Degradation Rate}}$$

where:

Post-OPE = efficiency after overhaul
Pre-OPE = efficiency prior to overhaul

This approach directly links EUL to the observed degradation cycle of the equipment, ensuring that the estimate reflects actual field performance rather than generalized assumptions.

Please note, typically EUL is based on the median number of years a component survives before 50% of the units have failed or been removed. The recommended approach to evaluate this is a survival analysis curve, defining EUL as the median remaining life where the survival probability equals 0.5, to better reflect median system performance.

However, the current dataset does not contain the type of information necessary to support a reliable survival model. The available records consist only of pump test dates and their associated efficiency values. Survival analysis requires clearly defined failure events, standardized criteria for end-of-life, and a sufficient sample size to generate meaningful survival curves. In the absence of recorded failures, this method becomes uncertain and may misrepresent the true condition of the equipment. Furthermore, the

irregular test intervals and limited number of observations restrict the possibility of developing a valid survival distribution.

Given these constraints, the application of survival analysis would likely increase uncertainty rather than improve accuracy in EUL estimation. Therefore, the degradation-based method offers the most reliable approach for estimating EUL and this methodology has been accepted previously in EO-39.

Proposed Solution*

SCE is proposing a conservative EUL of 9 years for Pump Overhauls. As demonstrated in the table below, the EUL can range from 9-15 years based on pump type from a large sample of 4,120 pumps that were historically tested by [redacted]. Please see the table below from the Pump Overhaul EUL Analysis.xls attached with this EO.

Pump Overhaul EUL

	Pre-OPE	Post OPE	Average degradation rate	Number of pumps used in computing degradation	EUL
Centrifugal Booster	43.09	62.91	1.81	604	11
Submersible Booster	41.73	60.33	1.21	181	15
Submersible Well	35.99	54.83	2.22	458	9
Turbine Booster	50.13	69.98	1.82	1176	11
Turbine Well	46.08	65.34	2.02	1701	10

We strongly believe that the proposed EUL values for pump overhaul measure are consistent with the Energy Efficiency Policy Manual and Statewide Custom Project Guidance, and reflects a preponderance of evidence based on historical overhaul intervals, OEM data, and expected savings persistence.

Supporting Information / References*

EE Policy Manual V6 April 2020, CPUC Decision D.16-08-019, E-4818, and E-5221

CPUC Staff Clarifying Question(s) to PA (if needed)

January 8, 2025

1. Has SCE discussed this EO with other IOUs? If so, please provide their contacts.
2. How are you demonstrating that post-overhaul efficiency improvements are sustained over time? The current comparison appears to rely on pre-OPE vs. post-OPE conditions. What evidence supports that the post-OPE efficiency persists beyond the immediate period following the overhaul, and over what duration is persistence assumed?
3. Was there a persistent study done for the pump overhaul measure that support greater EUL claim?
4. The reported efficiency value in the "Pump Overhaul EUL Analysis.xlsx" workbook is labeled as Overall plant efficiency. Can you confirm whether this represents plant-level efficiency or pump-specific efficiency? If it is plant-level, how is degradation attributed to the specific pump being evaluated? Could the observed degradation be driven by other operating pumps, while the referenced pump primarily serves a backup or redundancy role?
5. What are the usage factors and operating hours for the pumps presented in the analysis?
6. Some data points show efficiency values as low as [redacted] for a submersible booster pump. How realistic are values at that level?
7. In some instances, why is there is a difference in motor hp between pre-OPE and OPE?

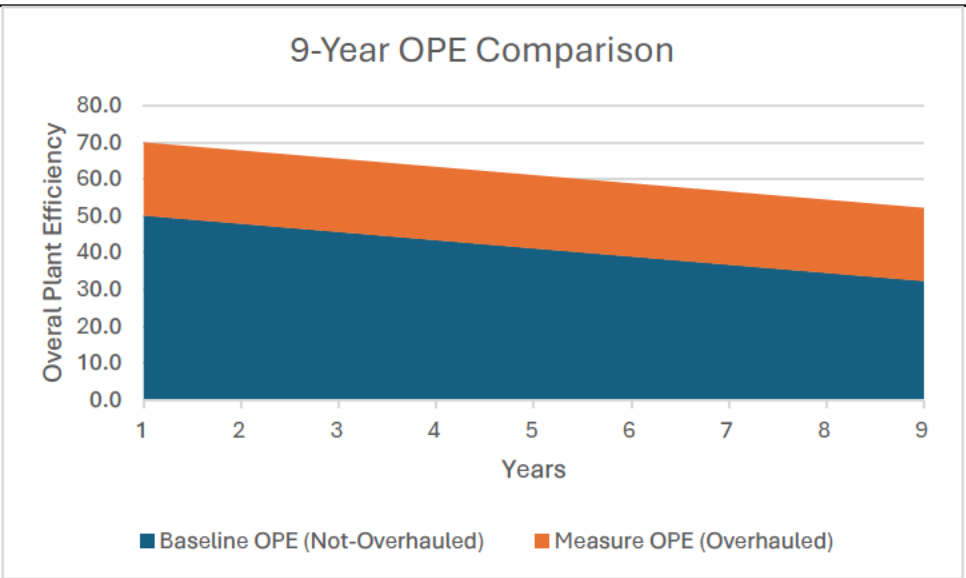
1) PA Response

June 10, 2026

Please see below for answers to the clarifying questions provided:

1. SCE has circulated the EO with other IOUS. Please see below for their contact details:
   a. [redacted]
2. Please note, the evidence provided is in the form of a degradation rate analysis from more than 3,000 pump test records collected between 2016 and 2024 from the [redacted]. The EUL analysis provided (Pump Overhaul EUL Analysis.xlsx uploaded to CMPA 5/21/2026) is based on a degradation rate calculated from the provided pump test database. The analysis confirms the typical % efficiency decrease that is expected for the pumps. The proposed conservative EUL of 9 years is based on a 2.22% degradation rate between average post overhaul OPE and pre overhaul OPEs. It is important to also note that the same degradation rate would be applicable to baseline scenario (non-overhauled pump). To show how the savings persistence from the measure would look, a graph is provided as an example comparing a pump that is not overhauled to the case of it being overhauled over the 9-year period:

Year	Baseline OPE (Not-Overhauled)	Measure OPE (Overhauled)	OPE Improvement
1	50.1	70.0	19.9
2	47.9	67.8	19.9
3	45.7	65.5	19.9
4	43.5	63.3	19.9
5	41.2	61.1	19.9
6	39.0	58.9	19.9
7	36.8	56.7	19.9
8	34.6	54.4	19.9
9	32.4	52.2	19.9



3. Please see the degradation analysis provided in the attached EUL analysis provided (Pump Overhaul EUL Analysis.xlsx) which informs on the persistence of savings following a pump overhaul. As mentioned in the above analysis, although the pump's efficiency would degrade after being overhauled, the baseline scenario would be a more degraded pump that continues to degrade over time.
4. The "Plant" in Overall Plant Efficiency refers to a single pump. The Overall Plant Efficiency refers to the pumping system including both the pump/bowl efficiency and motor efficiency. It is confirmed that the provided OPE values represent individual pumps. Each individual pump within the dataset has a unique pump reference number. Even if there are multiple pumps at a station, the OPE is not measuring the efficiency of a pump station with multiple pumps. Each pump at a station will receive its own individual "Overall Plant Efficiency" number once tested.
5. The [redacted] includes annual hours and kWh to determine usage factors. However, these numbers have historically been estimates and not individually measured values as metering for each individual pump is not available for longer periods of time. The numbers can be accurate for single pump on single meter scenario, but accuracy is lost when kWh data is from meter at plant with multiple end users. As such, operating hours are not presented in the analysis.
6. It's unclear how realistic a 4.31% efficiency is, for example pump mentioned. However, our analysis is based on a 10^{th}-90^{th} percentile range to ensure outliers are not included in the results. Please see table in cells AL2:AQ5 of each pump type tab for our percentile calculations to exclude values outside of 10-90^{th} percentile. As such, outliers are not included in the analysis to estimate degradation rates and hence the proposed EUL number.
7. Changes in motor size are typical when the pump is rightsized as part of its project. Rightsizing the pump is an option to ensure the required range of service levels (GPM and TDH) are met efficiently instead of installing a VFD, or a Pony Pump System. Please note, the activity of properly rightsizing only impact the resulting OPE, ensuring a higher OPE for any change in service level, and does not affect the degradation rate used to substantiate the EUL.

1) CPUC Response (if needed)

August 3, 2026

CPUC staff reviewed the updated degradation analysis and EUL estimates and agree that the revised methodology more appropriately evaluates the persistence of savings associated with the pump overhaul measure. Based on the updated analysis, the estimated EUL values for individual pump types range from approximately 5.7 to 11.3 years. This range provides evidence that the efficiency improvements resulting from pump overhauls persist for at least five years. However, CPUC staff note that the available degradation dataset remains limited, and additional data are needed to confidently support a more precise measure EUL estimate within the reported range. A review of the underlying data indicates that many pumps have only one or two post-overhaul degradation observations. While these data points provide an initial indication of degradation trends, a longer post-overhaul observation period would provide greater confidence in the estimated degradation rates and resulting EUL values. Given the currently available evidence, CPUC staff recommend adopting a measure EUL of 5 years for the pump overhaul measure at this time. CPUC staff further recommend updating the degradation analysis once additional pump test data become available, ideally after at least six months of additional data collection. Expanding the dataset with longer degradation histories and additional post-overhaul observations will help better characterize the degradation trajectory of overhauled pumps and support a more robust estimate of measure EUL in future updates.
2) PA Response
Click or tap to enter a date.
2) CPUC Response (if needed)
3) PA Response
Click or tap to enter a date.
3) CPUC Response (if needed)
Click or tap to enter a date.

CPUC Conclusion
September 3, 2026

Following feedback discussions with [redacted] during the August 13, 2026 bi-weekly CPR call, CPUC staff revises the initial measure EUL recommendation from 5 years to the minimum estimated EUL value of 5.7 years.

CPUC staff further recommends updating the degradation analysis once additional pump test data becomes available, ideally after at least six months of additional data collection. The interim 5.7-year EUL may be reassessed based on an updated degradation analysis that incorporates an expanded dataset, a longer degradation history, and additional post-overhaul observations.

CPUC EO SUMMARY	
Is this EO statewide applicable? Yes	
EO Title	Non-DEER EUL for Pump Overhaul
EO Tracking Number	EO-49**Error! Reference source not found.**
Summary of EO Issue(s)/Question(s)	
The [redacted] submitted an EO requesting approval of a non-DEER EUL of 9 years for the Pump Overhaul measure. As supporting evidence, the program initially provided pre- and post-overhaul pump test data and a degradation analysis that included a broader population of pumps beyond those directly impacted by the retrofit measure. Following discussions with CPUC staff regarding the objective of estimating the EUL of the pump overhaul measure, the program revised the methodology to focus on pumps with documented overhaul events and associated post-overhaul degradation data. The updated analysis was used to evaluate the persistence of efficiency improvements resulting from the overhaul measure and to estimate an appropriate measure EUL.	
PA response	
Summary of EO Conclusions, Recommendations, and Guidance	
CPUC staff reviewed the updated degradation analysis and associated EUL estimates and found the revised methodology reasonable for evaluating the persistence of savings from the Pump Overhaul measure. Based on the updated analysis and available data, estimated pump-specific EUL values range from approximately 5.7 to 11.3 years. The available evidence supports the conclusion that the efficiency benefits associated with pump overhauls persist for at least 5 years. However, CPUC staff note that the degradation dataset remains limited. While the analysis includes a substantial number of pumps, relatively few pumps have long-term post-overhaul observations, and many pumps have only one or two degradation data points available. A greater number of pumps with at least three post-overhaul observations would provide a more reliable basis for characterizing degradation trends and estimating measure EUL. Given the current evidence, CPUC staff recommend approval of a 5.7-year EUL for the Pump Overhaul measure at this time. CPUC staff are open to reassessing the EUL with an	

updated degradation analysis after at least six months of additional data collection. A larger dataset with longer post-overhaul degradation histories will support a more robust estimate of measure EUL in the future.