CPUC Staff Ex Ante Review

CPUC Staff Project ID Number	PGE_22_T_C_749_PRJ - 03237490_HVAC
CMPA Directory Link	https://deeresources.info/cmpa/projects/20182
PA	PGE
PA Application ID	PRJ - 03237490
PA Application Executed Date	
PA Program ID	PGE_COM_004
PA Program Name	Nexant - Advanced Energy Program - Custom Retrofit
PA Program Year	
Date of CPUC Staff Review:	4/19/2022 (PRE), 11/27/2024 (POST)
PA CMPA Upload Dates Included in this review:	
First PA Upload	3/4/2022
Second PA Upload	N/A
Third PA Upload	N/A
Fourth PA Upload	
Fifth PA Upload	
Sixth PA Upload	
Seventh PA Upload	
Eighth PA Upload	
PA Measure Description(s):	
Measure 1	HVAC RETROFITNEW-AHUPACKAGE UNITS-DATA CENTER-AIRFLOW UPGRADE WITH VFD
Measure 2	HVAC DATA CENTER - HOTCOLD AISLE CONTAINMENT - To-CodeStd
Measure 3	COMMISSIONING-RCX RECODE CONTROLS-PROCESS-OTHER
Measure 4	
Measure 5	
Measure 6	
Measure 7	
Measure 8	
Measure 9	
Measure 10	
PA Project Description:	[redacted] Data Center Optimization
Bi-Monthly Upload kW Demand Reduction	124.8
Bi-Monthly Upload Annual kWh Impacts	1,093,009.9
Bi-Monthly Upload Therms Impacts	0.0
PA Proposed Incentive $ (to Customer)	592,543.22
Project Documentation kW Demand Reduction	38.1
Project Documentation Annual kWh Impacts	334,139.8
Project Documentation Annual Therms Impacts	0.0
Project Documentation Incentive $ (to Customer)	$28,301.70
CPUC Staff Primary Reviewer Name	[redacted]
CPUC Staff Primary Reviewer Firm	DNV
CPUC Staff Review Supervisor Name	[redacted]
CPUC Staff Review Supervisor Firm	Quantum
PA Primary Reviewer Name	
PA Primary Reviewer Firm	
CPUC Staff Project Manager	
CPUC Staff Policy Authorization (as needed)	
CPUC Staff Recommendation:	**Application ready to proceed with exception(s), as noted**
For rejection, action required:	N/A
M&V Review:	Post M&V Review (M&V Results and Final Calculations) Required

Action Number:	Summary of CPUC Staff Required Action by the PA:	Action Category	PA Response (10/23/2024)	CPUC Response (11/27/2024)
1	Please resubmit the project for post-installation review.	Continue Document Upload	10/23/24 - The project package (*PRJ - 03237490 CPR 749 Post Project Package-CONF.zip*) includes: Installation Report, Post M&V savings calculations, Post M&V trend data, Invoices, Post Install Maintenance logs. It should be noted that the final incentive has decreased significantly. The final combined incentives for Phase I and Phase II are less than $100 k warranting less scrutiny in PG&E's opinion.	Post-installation package shows that savings and incentives were reduced from 1,093,09kWh, 124.8kW, and $92,543 (pre-installation) to 334,140kWh, 38.14kW and $28,301 (post-installation).
2	The "Pre- EI Project Page" document shows a capped incentive of $91,101 but the bi-monthly upload and other project documentation show an uncapped incentive of $92,543. Please clarify the correct incentive amount and update the next quarterly submission, if needed.	Incentive calculation	4/22/22 - This is an issue with Energy Insight (EI) and the new third party flexible incentives. The "Total Uncapped Incentive" should be the correct amount which matches the approved values in the project documentation. PG&E is working on the EI process to correct this issue. 10/23/24 - The final incentive amount is **$28,301.69** .	
3	The "Pre- EI Project Page" document the building type as Commercial. It is not clear why Data Center building type has not been used. Phase 1 of the same project (CPR project 575) used building type of "Manufacturing - Light Industrial". Please use a consistent building type that is appropriate based on the customer building.	Other 1	4/22/22 - Our system (EI) only has the "Parent Type" building codes. In the future, we will aim to make these consistent between projects of the same customer. Data centers do not fall cleanly in any of the parent building types, so it resulted in two different selections in our system that both "could" fit. 10/23/24 - Changed building type to "Data Center" to be consistent with Phase 1 submission.	
4	The maintenance records provided for this project as part of preponderance of evidence (POE) are old and does not show equipment are being maintained after 2019. Please provide the updated maintenance records for this project in the next submission.	ER preponderance of evidence	10/23/24 - Refer to the attached file "PRJ-03237490 Maintenance Calendar 2022-CONFIDENTIAL.xslx & *PRJ-03237490 Maintenance Calendar 2023-CONFIDENTIAL.xslx* " for preventative maintenance details.	
5	The PA did not include enough information about Phase I of this project (CPR project 575) and did not clearly describe the overlap between Phase I and Phase II (this project). Going forward, if a project overlap with a previously implemented project, please clearly identify the old project ID and the possible overlap that may impact savings estimates.	Missing required information	10/23/24 - There is no overlap for this project with previous (phase I) project Phase I had 17 CRAH units that added EC motors and aisle containment, and 16 CRAH units that just had aisle containment. The timeline for this phase I was from June 2020 to March 2021. Phase II has 19 CRAH units that added EC motor which were not a part of Phase I. The timeline for phase II was from May 2021 to February 2024.	PG&E did not address this issue adequately, despite our detailed recommendations and notes provided in the disposition. Based on the documentation we received for Phase I (CPR project 574) and Phase II (this project), there is a clear overlap and a mismatch between the approaches and assumptions made in Phase I and Phase II. Please refer to the next item for further details.
6	The PA submitted calculation for Phase II is not consistent with final approved calculation for Phase I. It appears that the PA is overestimating savings for phase II (this project). Phase I implemented two improvements: EC motors on CRAH fans and aisle containment. These two measures were implemented in two different boundaries. That is, the CRAH units fitted with EC Motors in Phase I did not have containment isolation and the CRAH units that added containment did not have EC Motors. However, the CRAH units that added EC motors in Phase I will have containment in Phase II and the CRAH units that had containment in Phase I will have EC motors in Phase II. Thus, at the end of Phase II, all CRAH units have the same treatments. For Phase I, the final approved savings calculation for containment measure claimed savings by shutting down six CRAH units in the post case (out of 16 CRAH units included in Phase I containment measure). Containment measure usually claims savings by allowing the CRAH fans to operate at a reduced speed compared to its baseline as the airside differential temperature goes up. However, since both measures had different boundaries (as discussed above), the facility did not have ability to reduce the CRAH operating speed and rather allowed to shut down six CRAH units instead (the remaining 10 units could meet the load). Since the facility will have both measures (EC motors and containment) implemented on all CRAH units by the end of Phase II, the PA should make sure that there is no overlap in savings for Phase I and II. To do this, the PA should first estimate savings for the entire project (Phase I and Phase II). Then Phase II savings should be calculated as total savings minus claimed savings for Phase I. Therefore, we are requesting the PA to conduct a post project M&V at the end of Phase II to include all CRAH units included in Phase I and Phase II. This M&V period should cover 4 weeks and include both spot measurements and EMS data trending (where possible). Please resubmit the project for our review when Phase II savings are estimated. This should clearly document Phase II first and second baseline savings and the RUL/EUL values for all measures. As part of this submission, please also include first and second baseline savings and RUL/EUL values claimed for Phase I. In the note sect on below, we have included some suggest ons on how to do f nal analys s to help the PA w th est mat ng final savings.	Calculation method	10/23/24 - There are completely different CRAH units in scope for phase II from phase I The measures contained in each phase are listed below: -Phase I saw installation of EC motors and aisle containment to 17 CRAH units (2,3,4,5,6,7,8,9,11,13,14,23,24,25,26,27 and 30) and aisle containment only (AOE) for 16 CRAH (10,12,15,16,17,18,20,28,31,32,33,34,35,36,37 and 38) -Phase II saw the installation of EC motors (EEM-1) to remaining 19 CRAH units (10,12,15,16,17,18,19,20,21,22,28,31,32,33,34,35,36 and 37), and airflow management & control optimization and airflow management (EEM-2) to these 19 CRAH units (all units had). Where EEM-1 was only efficiency savings gained by higher efficiency EC motors replacing old constant speed motors by running at lower speed to meet the same IT load, and EEM -2 was calculated taking EEM -1 post as EEM-2 baseline and then applying airflow management. EEM - 3 was calculated for central plant that serves entire building (phase I and phase II units combined) where post install trends at the end phase II were used to normalize the building load. Refer to the Notes item 2 for calculation details. Please see CMPA folder for CPR 575 Post Project package for full details. Phase I final Disposition and savings claim summary are provided in this project package.	PG&E did not adequately address this issue. The overlap in savings calculations between Phase I and Phase II remains unresolved. To understand this issue, PG&E should revisit the "assumptions" made in the Phase I savings calculations. For example, in Phase I, PG&E claimed savings for the aisle containment measure implemented in Suite 200 (S200) by turning off CRAH 10. However, in Phase II, PG&E's savings for ECM installation in the same room assumes this unit is on and operating at 100% speed. This discrepancy also applies to CRAH units in Suite 100 (16, 18, 20, 33, 35) which turned off in Phase I. It is evident that there is a clear overlap and a mismatch between assumptions made for Phase I savings and those made for Phase II savings. Here are some additional issues with the mismatched assumptions between the two project phases that result in inaccurate savings accounting: - For Phase II EEM-1, PG&E calculated savings based on existing conditions. In contrast, for the same measure in Phase I, post-installation savings were calculated based on a code baseline. - The calculation approaches for aisle containment savings differ between Phase I and Phase II. - In Phase I, the aisle containment measure used 16 CRAH units in the baseline and 10 CRAH units in the post-case, assuming that six CRAH units would be turned off after Phase I containment. However, these assumptions were not upheld in Phase II. The CRAH units (10, 16, 18, 20, 33, 35), which should have remained "off" after Phase I (and in the Phase II baseline), were shown to be drawing power. - In phase I, the aisle containment measure installed in Suite 300 wasn't properly commissioned and the issue was planned to be addressed through further commissioning efforts in Phase II. Given the interactions between Phase I and Phase II measures, and considering that the analysis for Phase II appears to have been conducted independently of Phase I calculations, our recommendation was to treat both phases as a single project. At the conclusion of Phase II, the recommended approach was to claim savings for Phase II as the difference between the combined savings of both phases (Phase I + Phase II) and the savings claimed for Phase I alone. PG&E did not adhere to this recommendation.

7	In addition to the propose M&V plan by the PA, please collect the following data for 4 weeks as part of the M&V plan: -Post-install IT load and other heat loads for each room -Pre- and post- airside differential temperature for each CRAH units (if not available, collect the average for each room/area) -Pre- and post- number of CRAH units that are operating -EMS trends on current (amp) or power (kW) of all installed EC motors (Phase I and II). If EMS data are not available, perform spot power (kW) measurements on sampled CRAH units	M&V plan	10/23/24 - At least 4 weeks worth of data was collected as a part of post M&V -Post M&V IT load data was collected as shown in M&V Utility & IT Data tab of PRJ-03237490 (AEP-01) Post M&V Saving Calculation sheet. Suite level trend data was not available hence it was calculated as shown in Post Suite Loads tab of same calculation sheet. -Pre- and post- airside differential temperature for each CRAH units were collected, refer to the PRJ-03237490 (AEP-01) Post M&V Data 1 file. -Pre and Post-number of CRAH units that are operating are updated in PRJ-03237490 (AEP-01) Post M&V Saving Calculation sheet. -Spot power (kW) measurements were taken on sampled CRAH units as shown in PRJ-03237490 (AEP-01) Post M&V Fan Curve file.	
8	According to the project feasibility study (PFS), the RUL of the first measure (CRAH Fan replacement with Electronically Commutated (EC) fan motors) is 1/3 of EUL (15 years based on the PG&E data center baseline study). Then the PFS continues to say because each CRAH unit receives comprehensive maintenance, the EUL of CRAH units after this measure is 10+ years. Note that it is not allowed to revise the EUL of equipment based on site-specific maintenance practices. Assuming Accelerated Replacement (AR) measure application type is correct, then the EUL of CRAH units should be capped at 15 years (i.e., EUL-RUL is 10 years). In addition to this, the PA did not clearly explain why this measure should be categorized as an accelerated replacement measure (AR) rather than Normal Replacement (NR) or Add-on Equipment (AOE). We are allowing this measure to go through as AR for this project given Phase I was approved as AR. However, for similar projects in future, we are asking the PA to clearly explain why this should not be classified as NR or AOE.	EUL/RUL	4/22/22 - In summary, PG&E is in agreement with the disposition and is using the same methodology in the approved EUL's. The first baseline savings have an EUL of 5 years and the second baseline savings have an EUL of 10 years.	

Note or Instruction Number:	CPUC Staff Notes or Instructions:	Instruction Category	PA Response	CPUC Response
1	We are requesting the PA to perform a new Industry Standard Practice (ISP) study for data centers. The existing 2016 study is old and data center practices have changed since then. We are asking the PA to initiate discussions about conducting a new ISP study with CPUC staff within 30 days of this disposition. This is the ISP note included in the Phase I of this project (CPR project 575): We may request a new standard practice study for data centers as the existing studies seem outdated. CPUC staff will follow up on this request with additional information.	Baseline	10/23/24 - PG&E and CPUC staff had correspondence and a memo about this instruction.	This issue remains open for future data center projects. Note that as computing demands continue to increase, the need for expanded data center infrastructure will likely increase, which may translate to additional EE measures/projects within these facilities.
2	Following steps can be followed to estimate savings for the base case (Phase I pre) analysis: 1.Use the existing CRAH fan motor efficacy (W/kBtu.h) as the baseline instead of the code (27 W/kBtu.h). This is because the PA has verified that the existing fan efficacy is better than the code value. 2.Collect the IT load (kW) at the end of Phase II and use the same IT load for determining total sensible load for the baseline. If IT load (kW) is available for each room or area at the end of Phase II, they should be used individually for each room in their baseline models. 3.Once the total sensible load is determined for each room/area, use the existing W/kBtu.h to determine the baseline fan power (kW) for individual CRAH unit. 4.Document the pre-project airside differential temperature (Deg F), if they are available for each CRAH units or use the average for each room/area. The project CRAH fan power improvements over the baseline annual kWh will be realized in two steps: 1) For the containment measure (EEM-1), the post case will have reduced CRAH fan CFM or lesser number of CRAH in operation to meet the same IT load. The reduced CFM (and power) will be because of the higher airside deltaT after the installation of containments and will not include savings from the improved EC motor efficiency. 2) For the EC motor efficiency, the measure case will have the same CFM as the post case of EEM-1. The measure savings for EC motor will come from the improved efficiency of EC compared to the pre-existing motors. PA will conduct the spot measurement of motor power and EC motor speed (to determine cfm) to determine the CRAH fan W/CFM. This can be applied in EEM-1 CFM to determine EEM-2 CRAH fan kW and annual kWh. Besides CRAH fan kW (or annual kWh) savings, there can be additional savings from CHW system. PA is required to document the CHWST for both baseline and post Phase II periods and determine additional chiller savings, if CHWST has changed over its baseline value. Following steps can be followed to estimate savings for post case (Phase II post-) 1.Determine the number of CRAH units that are off or not required to be operated. This will determine the number of remaining CRAH units to be included in post case analysis. 2.Collect the facility EMS trends the current (amp) or power (kW) of the newly installed EC motors in Phase I and II. If EMS data are not available, perform spot power (kW) measurements on sampled CRAH units for each room or location. In fact, the PA followed the post-project spot measurement for Phase I and the similar spot measurement to be conducted at the end of Phase II. The spot power measurement collected at the end of Phase I will not be used for this analysis. 3.Document the airside deltaT for the baseline and post Phase II periods for all CRAH units or at least for rooms/areas. From the designated IT load for each CRAH unit (assigned in the baseline model), the analysis can calculate the baseline CFM by using total sensible load (kBtu) and airside deltaT. 4.For the same IT load, determine corresponding CFM with the containment measure (EEM-1). Subsequently, use the baseline CRAH fan power and post EEM-1 CFM to determine the post EEM-1 CRAH fan power. This will determine the post case CRAH fan power and annual kWh. By comparing the baseline annual kWh and post EEM-1 annual kWh, PA can determine EEM-1 savings for both Phase I and Phase II. 5.For EEM-2 savings, PA will determine CRAH CFM and EC motor power for all CRAH units either through spot measurement or through EMS data. EEM-2 savings will be for EC motor without any double counting with EEM-1. As EEM-2 claims only the EC motor savings it will have smaller W/cfm compared to any non-EC motor. Based on the measured data, calculate W/cfm for each CRAH which will be multiplied with the post EEM-1 CFM to determine EEM-2 fan motor power (kW). To determine EEM-2 savings, take the difference of post EEM-1 fan annual kWh and post EEM-2 fan annual kWh. We cannot say if there will be any chiller plant savings at this time. For the verification, PA should document the average supply and return air temperatures for all CRAH units and compare them against the corresponding supply and return air temperatures across all CRAH units in their baseline conditions. This will verify that the cold aisle containment in fact contributed to the higher differential air temperature and therefore, reduced CFM in the post case. The new EC motors in CRAH helped realize them with reduced motor speeds. If the change in air side differential temperatures are significantly different from the baseline values, one should expect higher secondary CHW supply temperature than its corresponding value in pre Phase I period.	Calculation method	4/22/22 - The project is not double counting savings with Phase 1. Therefore, PG&E does not believe that this calculation approach is required as the existing methodology already uses post-install Phase 1 M&V as the baseline for Phase 2 EEM's. 10/23/24 - Below are the details for each EEM: EEM 1: -The updated CRAH fan motor efficacy (W/kBtu.h) was used instead of the code (27 W/kBtu.h). For each CRAH unit s airside differential temperature (Deg F) was documented to verify the implementation of measure. -Post M&V IT load (kW) was collected, and it was updated for baseline as well. The suit level IT load trend was not available; however, it was calculated based on suite level SAT, RAT and Avg. VFD fan speed. The maximum CFM for upgraded EC motors were used to calculate the CFM for each suite. -In baseline the measured power drawn for each fan model was obtained and used to determine the baseline fan power (kW). The post verified fan power was updated based post M&V fan speed. The fan curve was updated after collecting spot measurements in post M&V phase. -As EEM1 and EEM2 are interdependent it was suggested to use theoretical post M&V CRAH fan VFD speed for this measure. However, CRAHs in suite 200 showed positive results. Hence only this suite uses theoretical VFD speed and other suite used post M&V trend data. EEM 2: -Determined the number of CRAH units that are operating. -Collected the spot power (kW) measurements on sampled CRAH units in various suite of the newly installed EC motors in this Phase at different VFD speed to update fan curve. -Documented the airside deltaT for the baseline and post Phase periods for all CRAH units. The documented IT load from post phase was updated for the analysis that calculate the baseline and post phase CFM by using total sensible load (kBtu) and airside deltaT at suite level. -This EEM only includes savings from airflow management by adding additional containment/ barrier. The average post phase supply and return air temperatures for all CRAH units were compared against the corresponding supply and return air temperatures across all CRAH units in their baseline conditions to verify the cold aisle containment contributed to the higher differential air temperature which reduced further CFM in the post case after upgrading these CRAH units with EC fan motors. This measure was only successfully implemented in suite 200. EEM 3: -Waterside differential temperature (Deg F) was documented along with secondary chilled water pump speed. The baseline chilled water supply and return temperature was compared with post case to verify the implementation. As the air side differential was not improved as expected, the chilled water supply temperature was reduced with higher waterside delta temperature in post phase. -The secondary chilled water pump speed reduced as compared to baseline which mainly contributed to savings for this measure. -The load among circuits were disturbed based on CRAHs in corresponding circuits. The pump efficiency was calculated using modified pump curves.	

CPUC Staff Recommendation Definitions	
CPUC Staff Recommendation	**Definition**
Application ready to proceed without exception	The PA will continue to upload application documents to the CMPA directory through the implementation and claims phases of the project. The PA may proceed to approve the project without waiting for CPUC Staff response. A project is waived from further review at the post-installation stage by CPUC staff, but the PA is responsible for post-installation (IR) review. There will not be conditional approval.
Application ready to proceed with exception(s), as noted	The PA must make revisions or changes as noted in CPUC Staff's review comments before signed agreement with customer. The PA will continue to upload application documents to the CMPA directory through the implementation and claims phases of the project. The PA may proceed to approve the project without waiting for CPUC Staff response. If CPUC Staff decides to perform IR review of a project, CPUC Staff will notify the PA. The scope will be limited to determine if the project was carried out consistent with the application and notes provided during pre-installation review and to obtain information pertaining to whether the eligibility criteria or metrics should be revised. Unless the scope of work presented in project application has changed at IR review, the project will not be reviewed again in the areas specified below. Scope change is defined by substantial changes include significant modifications to the proposed equipment type, size, quantity, configuration, the expansion of a project to include additional retrofits, or the splitting of a project into multiple phases. The following areas will not be reviewed again by CPUC Staff: • Calculation Tool • Calculation Methodology • M&V Plan • Baseline • Eligibility • EUL/RUL • Measure Type • Program Influence
Application rejected.	The application is rejected as submitted. The PA shall promptly inform the applicant as to the reasons why the project was rejected and the specific recommendations for the conditions under which the project would be approved. CPUC Staff shall provide the reasons for the rejection or request for modification, including each basis as to why the project is rejected, or modification is requested. In addition, CPUC Staff shall provide specific recommendations for the conditions under which the project would be approved. If any party to the project is unsatisfied with the Commission's directions for the project, a dispute resolution process may be initiated by that party. The Commission shall adopt rules for the conduct of the dispute resolution process. – Section 381.2 (g) (3) (F)
Advisory.	The PA is not formally required to follow instructions or recommendations given in an Advisory review. However, issues found will affect ESPI scoring and may come up again in Ex-Post review.