

Initiative #3: Accelerating affordable building electrification across customer groups to enable community-scale decarbonization

SO 4: Reducing Cost of Whole Home Electrification

INITIATIVE DESCRIPTION

Page(s) 25

- Reduces the all-in cost of electrification by addressing customer retrofit costs, deployment complexity, and system planning barriers that increase costs for households, neighborhoods, and industrial customers.
- Combines customer cost reduction, electrification readiness planning, and grid optimization to enable scalable and affordable electrification across multiple customer segments.
- Achieving SO 4 requires both lowering installation costs and ensuring electrification occurs where grid and gas system investments can be optimized to minimize long-term customer costs.
- Together, the RTAs provide the tools, evidence, and deployment pathways needed to reduce electrification costs, accelerate adoption, and lower customer energy costs over time.

PROPOSED INITIATIVE BUDGET	\$11,079,167
% OF TOTAL BUDGET (excl. admin & overhead)	12.25%
# OF RESEARCH TOPIC AREAS	3

ALIGNMENT SUMMARY

STRATEGIC OBJECTIVE ALIGNMENT

Page(s) 25

“The EPIC program will accelerate innovation, demonstration, and reliable and scalable approaches to deployment that help reduce the all-in cost of whole-home electrification and enable demand flexibility / automated response to process signals or dynamic rates for single-family and multi-family buildings and manufactured housing [...] while decreasing residents’ energy costs.”

This initiative reduces the cost of electrification by lowering customer retrofit expenses, identifying where existing infrastructure can support new load, and aligning electric and gas planning decisions, together accelerating affordable electrification while minimizing long-term costs to customers.

CPUC ALIGNMENT

Page(s) 27-28

- Provides the customer segmentation, electrification readiness, and retire-versus-replace evidence needed for Long-Term Gas Planning OIR and SB 1221 implementation, helping the CPUC evaluate where electrification can defer future gas infrastructure investment.
- Produces validated electrification cost-reduction and customer adoption strategies that support implementation of policies like zero-emission appliance standards and inform CPUC policy planning and implementation decisions
- Develops feeder-level load and hosting capacity insights that support High DER proceeding and Integrated Resource Planning decisions related to electrification load growth and distribution system planning
- EPIC is appropriate because these utility-specific planning, customer integration, and operational capabilities must be demonstrated in real-world utility environments before **10** broader deployment.

3.1 Lowering the cost and complexity of building electrification from assessment to installation

WHAT PROBLEM ARE WE SOLVING?

Page(s) 55

Residential electrification remains slow, costly, and complex, with a fragmented assessment-to-installation journey, high and poorly understood costs across the cost stack, and confusing, hard-to-sequence incentives. The customer journey is fragmented across single-family, multi-family, and small and medium business settings, with long waits, overlapping incentives, and no single trusted entry point, and appliance failures frequently force a like-for-like gas replacement under emergency time pressure. This topic advances SO 4's goal of lowering the total cost of whole-home electrification by closing these cost and process gaps.

SO 4: Reducing Cost of Whole Home Electrification

Accelerating affordable building electrification across customer groups to enable community-scale decarbonization

START	2027
OUTPUTS	2028-2030
MARKET READY	2029-2035

ALIGNMENT SUMMARY

WHAT IS THE DISTINCT RESEARCH APPROACH?

- Demonstrates design and installation approaches that reduce the costs sitting beyond the appliance itself and tests automated load assessment and permitting tools across multiple PG&E jurisdictions, paired with customer-facing tools that simplify the incentive landscape and compress time-to-completion.
- Validates program models that expand eligibility, including pathways for multi-family and small/medium business customers not served by existing residential programs.
- Targets the whole retrofit cost stack rather than just the appliance and builds tools fast enough to keep electrification viable at the moment of appliance failure, when most replacement decisions are made.
- Gaps Addressed pp. 55

HOW WILL YOU KNOW YOU ARE SUCCESSFUL?

- Validated, lower-cost retrofit designs and an automated assessment/permitting tool that shortens the customer journey.
- Program models that increase the share of buildings able to participate, transferable across administrators.
- **Primary outcome:** Validated electrification pathways that reduce costs and complexity through automated assessment, permitting, and program delivery tools. **Metrics:** Reduction in customer retrofit costs and time-to-completion, and increased retrofits in ESJ communities
- Metrics and Impact Assessment p.56

HOW WILL YOU COORDINATE?

- Administrators will coordinate to divide scope by technology phase and regional building stock distinctions, with CEC leading appliance-, component-, and building retrofit technology development and validation while PG&E focuses on demonstrating novel install, permitting, path-to-adoption, and utility customer-integration approaches (Coordination p.57)
- Interfaces with the Gas RD&D program at the boundary between this RTA's electric-side customer-integration work and the gas-side analytical methods (Coordination p. 57).
- Builds on PG&E's residential electrification investments, including EPIC 4.02B, the Residential Smart Panel Lab and Field Study, the 120V Heat Pump Water Heater project, and the Residential Housing Characteristics Study (Leveraging Past RD&D p.56).

3.2 Planning and detection tools for zonal electrification readiness

SO 4: Reducing Cost of Whole Home Electrification

(Secondary) SO 6: Community-Scale Decarbonization

Accelerating affordable building electrification across customer groups to enable community-scale decarbonization

START	2027-2028
OUTPUTS	2029-2032
MARKET READY	2030-2035

WHAT PROBLEM ARE WE SOLVING?

Page(s) 58

Reducing whole-home electrification costs (SO4) requires neighborhood-level visibility that PG&E needs to reliably see where customer-led electrification is happening, identify which barriers constrain which neighborhoods, or determine which gas lines can be retired rather than replaced. Existing grid data and tools are not operationalized for zonal planning, and asset records are often incomplete, so electrification and gas investment decisions proceed without neighborhood-level evidence, exposing ratepayers to higher costs and delays. By generating feeder-level readiness evidence and detecting electrification as it happens, this Topic lowers the cost and timeline risk for electrification at customer and community-levels, adding support for SO 6.

ALIGNMENT SUMMARY

WHAT IS THE DISTINCT RESEARCH APPROACH?

- Uses AMI data, load disaggregation, appliance lifecycle modeling, and barrier mapping to identify where electrification is occurring, where customers face barriers, and where existing infrastructure can support additional electric load.
- Builds an electric and gas geospatial foundation, using AI/ML to infer missing service connections and asset details from existing records rather than resurveying the system.
- Operationalizes grid-edge AMI computation for planning and uses AI/ML to reconstruct incomplete asset records, enabling the hosting-capacity analysis that finer-tuned zonal planning requires.
- Gaps Addressed p. 58

HOW WILL YOU KNOW YOU ARE SUCCESSFUL?

- Validated detection, barrier-mapping, and load-hosting-capacity tools that show where electrification is occurring and which grid zones can readily support new load.
- Outputs inform identification and feasibility of non-pipeline alternative opportunities at scale, with early estimates of avoided stranded gas asset cost and deferred grid upgrade cost becoming available system-wide.
- **Primary outcome:** Validated zonal-readiness tools identifying least-cost electrification opportunities and gas asset retirement pathways. **Metrics:** Deferred upgrade costs through coordinated zonal electrification, and increased mapped gas branches and electric service connections.
- Metrics and Impact Assessment p. 59

HOW WILL YOU COORDINATE?

- Distinct from CEC’s validation of coordinated neighborhood-level decarb solutions and replicable deployment models, PG&E will fund electric system-side detection, barrier mapping, and load-hosting-capacity work for its service area, complementing PG&E’s 2026 Gas RD&D Plan by generating the feeder-level readiness evidence its gas-side decommissioning framework uses as inputs (Coordination p. 60).
- Builds on PG&E’s applications for grid-edge AMI meters in EPIC 4.02A and 4.02B, applying load-change detection and near-real-time grid measurement to zonal electrification (Coordination p. 60).
- Draws on the Residential Housing Characteristics Study (ET22SWE0022) for DAC and Hard-to-Reach baseline data (Leveraging Past RD&D p.59).

3.3 Unlocking electrification pathways for hard-to-decarbonize end uses:

WHAT PROBLEM ARE WE SOLVING?

Page(s) 61

Advancing SO 4's cost-reduction goal requires reaching the hardest-to-decarbonize customers, the large commercial and industrial loads including process-heat-intensive manufacturing that make up roughly 25% of PG&E's Scope 3 emissions. Though industrial heat pumps, electric boilers, and thermal storage exist, PG&E has no validated method to determine which processes can electrify or how converted load affects feeders, because metering does not disaggregate by process and existing hosting-capacity models cannot capture the step changes, harmonics, and inrush industrial equipment produces. By building that missing analytical foundation, this Topic lowers the cost and uncertainty of electrifying these hard-to-decarbonize end uses, its primary contribution to SO 5.

SO 4: Reducing Cost of Whole Home Electrification

(Secondary) SO 5: Innovative Approaches for Difficult-to-Decarbonize Sectors

Accelerating affordable building electrification across customer groups to enable community-scale decarbonization

START	2027-2028
OUTPUTS	2029-2032
MARKET READY	2030-2035

ALIGNMENT SUMMARY

WHAT IS THE DISTINCT RESEARCH APPROACH?

- Develops and validates novel methods to break interval gas metering down to the equipment level.
- Extends hosting-capacity modeling to converted industrial process load, validated against observed conversions to produce feeder-level capacity envelopes for planning.
- Builds integrated gas-and-electric planning tools with customer-class cost curves, aligning electric capacity planning with industrial equipment replacement cycles.
- Connects industrial energy use to electrification pathways and distribution impacts and models the step changes, harmonics, and transient inrush unique to electrified process equipment that residential and small-commercial hosting-capacity models cannot capture. (Gaps Addressed p. 61)

HOW WILL YOU KNOW YOU ARE SUCCESSFUL?

- Validated process-level gas load disaggregation and feeder-level hosting-capacity envelopes for converted industrial load.
- Integrated planning tools and cost curves showing where industrial electrification is viable and where the gas system retains a coordinated role.
- **Primary outcome:** Validated methodology identifying cost-effective industrial electrification pathways and enabling coordinated electric and gas decisions. **Metrics:** Share of targeted gas load with a defined electrification pathway, and count of high-value manufacturing sectors with validated process segmentation.
- Metrics and Impact Assessment p. 62

HOW WILL YOU COORDINATE?

- Coordinates with CEC gas-transition and industrial-decarbonization research, alongside PG&E's Gas RD&D work, with PG&E focused on the electric system-side disaggregation, hosting-capacity, and integrated-planning work for its service area (Coordination p. 63).
- Builds on the EIS Part 1 and PG&E's EIS Part 2 (R.21-06-017), which forecast feeder-level electrification load across customer classes but modeled only transportation and buildings; this RTA extends that framework to industrial and manufacturing process load (Leveraging Past RD&D p. 62).