

# Field Intelligent Technologies (FIT)

INITIATIVE DESCRIPTION

A24, A25

- FIT will demonstrate integrated sensing, inspection, monitoring, and field-data capabilities that provide decision-grade evidence on grid-asset condition, environmental exposure, risks, and performance needed for cost-effective climate adaptation and grid-hardening decisions.
- The initiative directly supports cost-effective grid hardening by generating field evidence that enables earlier identification of vulnerable infrastructure and informs risk-based adaptation, hardening, maintenance, and replacement decisions.
- Its three RTAs collectively combine broad-area inspection, localized grid-edge and hazard visibility, and continuous asset-condition monitoring to generate the field intelligence needed to understand asset condition, climate exposure, and infrastructure risk.

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|--------------------------------------------|--------------|
| PROPOSED INITIATIVE BUDGET                 | \$17,012,831 |
| % OF TOTAL BUDGET (excl. admin & overhead) | 25%          |
| # OF RESEARCH TOPIC AREAS                  | 3            |

ALIGNMENT SUMMARY

STRATEGIC OBJECTIVE ALIGNMENT

A24, A25

**“achieve more cost-effective operational practices and capital investments for grid hardening to maintain grid resilience and reliability to long-term climate impacts, with a focus on increasing affordability, reducing outage risk, and reducing social burdens of outages.”**

FIT produces field-validated data and evidence that improve understanding of asset condition, climate exposure, hazard risk, and long-term performance, enabling earlier identification of vulnerable infrastructure. Together, its RTAs support more targeted and cost-effective grid-hardening solutions that maintain reliability, reduce outage risk, and improve the timing and prioritization of grid-hardening investments.

CPUC ALIGNMENT

A26

- CPUC has identified a need for data, tools, technologies, and frameworks that improve long-term grid-hardening planning and support cost-effective climate adaptation and capital-investment decisions under long-term climate impacts.
- FIT will provide field-validated asset-condition, hazard-exposure, performance, outage-risk, and lifecycle-cost evidence to improve identification of vulnerable infrastructure and inform climate adaptation assessments, grid-hardening priorities, capital planning, and future rate-case decisions.
- Ratepayer-funded EPIC demonstrations are appropriate because credible validation requires representative utility assets, operating data, environmental exposure, maintenance information, and long-duration observation that vendors generally cannot independently provide.

WHAT PROBLEM ARE WE SOLVING? A62-A65

The Strategic Objective calls for data and tools that support cost-effective grid-hardening decisions, but inspections and damage assessments still rely heavily on direct field access, ground patrols, and fragmented data collection. Utilities lack validated approaches for rapidly and consistently identifying vulnerable infrastructure across large service territories and integrating inspection data into vulnerability assessments and capital-planning decisions. This RTA establishes repeatable methods for producing decision-grade field evidence that improves infrastructure-risk assessment and supports more informed grid-hardening decisions.

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

ALIGNMENT SUMMARY

| WHAT IS THE DISTINCT RESEARCH APPROACH?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | HOW WILL YOU KNOW YOU ARE SUCCESSFUL?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | HOW WILL YOU COORDINATE?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <ul style="list-style-type: none"><li>• Develop workflows that connect field inspections, analytics, and enterprise systems to support infrastructure-risk and capital-planning decisions. (A62, A63)</li><li>• Demonstrate autonomous aerial, ground, underwater, and collaborative robotic inspection approaches under utility operating conditions to determine where they can reliably identify vulnerable infrastructure and produce decision-grade field evidence at scale.(A62, A63, A64)</li><li>• Integrate layered sensing, cross-sensor data, and AI-assisted field assessments to improve asset-condition visibility and vulnerability identification. (A62, A64)</li></ul> | <ul style="list-style-type: none"><li>• Validated autonomous inspection approaches that produce decision-grade field evidence for identifying vulnerable infrastructure and informing grid-hardening decisions. (A62, A64)</li><li>• Demonstrated faster assessments, improved data quality and defect detection, and fewer hazardous field entries or truck rolls than conventional inspection approaches. (A64)</li><li>• Established scalable field-assessment methods supporting risk-based grid hardening, faster restoration, and lower-cost risk evaluation.(A64)</li><li>• Primary result: Validated autonomous inspection methods producing decision-grade field evidence for vulnerable infrastructure identification. (A62, A64)</li><li>• Metrics: Time to actionable field assessment, inspection cost per asset or circuit mile, and hazardous field entries avoided. (A64)</li></ul> | <ul style="list-style-type: none"><li>• Build on existing SCE drone applications and lessons from the EPIC 3 Wildfire Prevention &amp; Resiliency Technology Demonstration project. (A63)</li><li>• Resolve autonomy, payload, data-quality, analytics, cybersecurity, aviation, and workflow-integration gaps rather than duplicating routine inspection programs. (A63)</li><li>• Coordinate with the CEC and other EPIC Administrators to align complementary demonstrations and avoid duplication. (A63)</li></ul> |

# Dynamic Grid Edge Visibility

WHAT PROBLEM ARE WE SOLVING? A66

The Strategic Objective calls for data and tools that support cost-effective grid-hardening decisions, but field and grid-edge information is not consistently translated into actionable frameworks for operators, planners, and regulators. Existing systems do not provide an integrated, localized view of hazards, feeder conditions, field constraints, and infrastructure risk during climate-driven events. This RTA develops decision-grade visibility that translates localized hazard, feeder, and field-condition data into more informed operational and grid-hardening decisions.

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ALIGNMENT SUMMARY

| WHAT IS THE DISTINCT RESEARCH APPROACH?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | HOW WILL YOU KNOW YOU ARE SUCCESSFUL?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | HOW WILL YOU COORDINATE?                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| <ul style="list-style-type: none"><li>• Demonstrate integrated grid-edge visibility frameworks that create a unified, localized view of hazard conditions, feeder status, field constraints, and infrastructure risk. (A66)</li><li>• Develop actionable thresholds and human-supervised decision frameworks that translate grid-edge information into operational, hardening, and capital-deferral decisions. (A66, A68)</li><li>• Connect real-time grid-edge information with outage, operations, safety, emergency-response, and planning workflows to enable consistent application of decision-grade visibility. (A66)</li></ul> | <ul style="list-style-type: none"><li>• Produce decision-grade feeder visibility and validated decision frameworks for hazard identification and coordinated field and grid operations. (A66, A68)</li><li>• Demonstrate improved data quality, faster alerts and restoration, lower response costs, and reduced hazardous exposure. (A67)</li><li>• Show where visibility enables operational alternatives that avoid or defer capital upgrades. (A68)</li><li>• Primary result: Validated decision-grade grid-edge visibility framework. (A68)</li><li>• Metrics: Environmental-data latency and availability, outage or restoration-time reduction, and avoided or deferred capital investment enabled by operational alternatives. (A67)</li></ul> | <ul style="list-style-type: none"><li>• Build on prior SCE and EPIC grid-edge sensing, communications, analytics, and digital-substation work. (A67)</li><li>• Apply those capabilities to operations, planning, adaptive safety execution, and regulatory decisions rather than duplicating individual technologies. (A67)</li><li>• Coordinate with the CEC and other EPIC Administrators to align complementary demonstrations and avoid duplication. (A67)</li></ul> |

# Intelligent Asset Sensors

WHAT PROBLEM ARE WE SOLVING? A69

The Strategic Objective calls for data and tools that support cost-effective grid-hardening decisions, but many critical assets lack continuous visibility into condition, climate stress, degradation, and emerging failure modes. Existing information is fragmented across inspections, offline studies, event records, and asset-risk models, limiting proactive maintenance and investment decisions. This RTA develops asset-health intelligence that supports earlier identification of emerging asset risks and more informed maintenance, replacement, and grid-hardening decisions.

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ALIGNMENT SUMMARY

| WHAT IS THE DISTINCT RESEARCH APPROACH?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | HOW WILL YOU KNOW YOU ARE SUCCESSFUL?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | HOW WILL YOU COORDINATE?                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <ul style="list-style-type: none"><li>• Demonstrate asset-health monitoring capabilities that improve visibility into thermal stress, partial discharge, vibration, moisture intrusion, insulation degradation, fault evolution, and equipment-duty exposure. (A69)</li><li>• Integrate sensor measurements with waveform data, SCADA and ADMS information, risk models, digital twins, and asset-management workflows. (A69)</li><li>• Validate multi-sensor fusion and predictive analytics for condition-based maintenance, asset-life extension, targeted replacement, and climate-informed hardening. (A69, A71)</li></ul> | <ul style="list-style-type: none"><li>• Validate sensor configurations, data requirements, integration methods, and predictive analytics that improve asset visibility, fault identification, and maintenance prioritization. (A70-A71)</li><li>• Demonstrate earlier fault detection, improved asset-health and remaining-life estimates, fewer unplanned failures, and avoided costs.</li><li>• Show where asset-health intelligence enables condition-based interventions that avoid unnecessary maintenance, extend asset life, and defer replacement costs. (A71)</li><li>• Primary result: Validated predictive asset-health framework. (A71)</li><li>• Metrics: Incipient conditions detected before failure, improvement in remaining-useful-life estimates, and avoided replacement, repair, or emergency-response costs. (A71)</li></ul> | <ul style="list-style-type: none"><li>• Build on prior power-quality, digital fault-recording, waveform-analytics, asset-risk-modeling, SCADA, ADMS, and grid-sensing work. (A70)</li><li>• Advance individual-technology work through integrated data streams, asset-level sensing, multi-sensor fusion, and predictive analytics. (A70)</li><li>• Coordinate with the CEC and other EPIC Administrators to align complementary demonstrations and avoid duplication. (A70)</li></ul> |