

Safe and Advanced Field Execution (SAFE)

INITIATIVE DESCRIPTION

A29,A30

- SAFE evaluates technologies that improve how utilities execute field work, establish temporary service, and restore customers under increasingly complex operating conditions. SAFE focuses on safely accelerating the energization of electric infrastructure, recognizing that electrification and resilience goals depend on safe field execution.
- Electrifying difficult-to-decarbonize commercial and industrial sectors often requires substantial new grid infrastructure; SAFE evaluates safer, more scalable, and more cost-effective approaches to delivering and operating electric service.
- Large-scale electrification depends on the ability to safely deploy and energize infrastructure needed to serve growing commercial and industrial loads; SAFE evaluates innovative field-execution and safety technologies to determine whether they can safely and cost-effectively scale to support electrification.

PROPOSED INITIATIVE BUDGET	\$17,012,831
% OF TOTAL BUDGET (excl. admin & overhead)	25%
# OF RESEARCH TOPIC AREAS	4

ALIGNMENT SUMMARY

STRATEGIC OBJECTIVE ALIGNMENT

A29, A30

“accelerate innovative approaches, strategies, and business models to achieve lifecycle cost-parity for difficult-to-decarbonize commercial and industrial buildings and processes.”

SAFE aligns SO5 by evaluating innovative technologies that could reduce the cost, risk, and complexity of deploying, energizing, and operating the infrastructure needed to serve electrifying commercial and industrial customers. Because difficult-to-decarbonize sectors cannot realize electrification benefits until supporting infrastructure is safely deployed and placed into service, SAFE generates utility-scale evidence to determine whether advanced deployment, field-execution, and safety technologies can safely and cost-effectively accelerate commercial and industrial electrification at scale.

CPUC ALIGNMENT

A29,A30

- CPUC proceedings increasingly focus on transitioning customers from fossil fuels to electricity while maintaining affordability, reliability, and safety, creating a need for evidence on technologies that can safely and cost-effectively accelerate infrastructure deployment and energization.
- SAFE will provide utility-scale evidence on deployment timelines, energization, safety, scalability, and cost-effectiveness to inform future electrification planning, program design, infrastructure investment, standards development, and rate-case decisions.
- Ratepayer-funded EPIC demonstrations are appropriate because emerging field technologies require validation in actual utility workflows and consequential operating conditions before utilities and regulators can make informed deployment decisions supporting large-scale electrification.

WHAT PROBLEM ARE WE SOLVING?

A72

Electrifying difficult-to-decarbonize commercial and industrial sectors requires substantially more utility infrastructure to be constructed, energized, and placed into service. Traditional construction and field-deployment methods are becoming a limiting factor because they can be labor-intensive, slow to deploy, disruptive, and difficult to scale as electrification increases the volume and complexity of infrastructure work. Advanced Fleet & Field Gear addresses this gap by evaluating innovative technologies that could safely and cost-effectively accelerate infrastructure deployment.

Safe and Advanced Field Execution (SAFE)	
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?
• Demonstrate emerging deployment technologies, including semi-autonomous vehicles, intelligent tools, subsurface surveying, trenchless construction systems, connected mobile equipment, and worksite assessment technologies designed to accelerate infrastructure deployment. (A72, A74) • Evaluate performance, safety, usability, interoperability, and scalability under utility conditions to determine whether these technologies can safely and cost-effectively reduce infrastructure deployment barriers.(A72, A75) • Generate utility-scale evidence needed to determine whether these technologies are ready for broader deployment, providing validation that vendor testing and routine fleet replacement programs cannot establish. (A73)	• Validate technologies that improve crew readiness, worksite planning, field-data capture, and infrastructure deployment under utility operating conditions. (A74) • Demonstrate reductions in infrastructure deployment timelines, rework, safety exposures, and deployment costs while improving the cost-effectiveness of infrastructure needed to support commercial and industrial electrification.(A73) • Establish whether validated field-deployment technologies can scale across utility infrastructure programs. (A74) • Primary result: Validated infrastructure-deployment technologies. (A74) • Metrics: Deployment cost reduction, deployment duration, safety-risk reduction. (A74)	• Build on prior EPIC, DOE, and industry investments in grid modernization, field sensing, asset monitoring, and grid intelligence, extending those efforts into the physical deployment of infrastructure needed to support electrification. (A72-A73) • Build on the DOE-funded Grid Resilience and Intelligence Platform (GRIP), extending prior investments in planning, analytics, and grid visibility into the advanced field equipment and deployment technologies needed to deliver infrastructure projects more safely, efficiently, and at greater scale. (A72-A73) • Coordinate with the CEC and other EPIC Administrators to align demonstrations and avoid duplication. (A73)

Augmented Field Operations

WHAT PROBLEM ARE WE SOLVING? A75, A76

Large-scale commercial and industrial electrification depends on utilities' ability to safely deploy, energize, and maintain growing amounts of infrastructure. Augmentation technologies have not been sufficiently validated for utility environments such as energized equipment, confined spaces, extreme heat, or wildfire response. Augmented Field Operations addresses this gap by establishing utility-specific evidence on whether worker-augmentation technologies can safely overcome workforce and safety constraints limiting the speed, scale, and cost-effectiveness of electrification.

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WHAT IS THE DISTINCT RESEARCH APPROACH?	HOW WILL YOU KNOW YOU ARE SUCCESSFUL?	HOW WILL YOU COORDINATE?
• Explore whether human-augmentation technologies can safely overcome physical limitations that constrain infrastructure deployment, restoration, and electrification-related field work. (A75) • Evaluate whether wearable technologies, intelligent tools, and power-assistance systems can create step-change improvements in field capability, situational awareness, and real-time safety monitoring. (A75) • Establish whether augmentation technologies can safely expand the scale, duration, and complexity of work crews can perform, enabling faster, safer, and more cost-effective electrification infrastructure deployment. (A75, A77)	• Establish whether worker-augmentation technologies can safely reduce fatigue, ergonomic strain, execution errors, and other constraints that limit infrastructure deployment. (A76-A77) • Validate the safety, usability, durability, workforce acceptance, and value of augmentation technologies in utility environments. (A75, A76, A77) • Primary result: Validated scalable worker-augmentation capability supporting infrastructure deployment. (A76-A77) • Metrics: Infrastructure deployment cost reduction, fatigue-related incident reduction, infrastructure deployment duration. (A76)	• Build on prior workforce-safety, ergonomics, digital field-operations, and equipment-modernization efforts by establishing utility-specific evidence on augmentation technologies not previously validated for energized environments, pole work, confined spaces, extreme heat, or wildfire response. (A76) • Advance electrification-enabling capabilities by evaluating whether augmentation technologies can safely overcome workforce and safety constraints that may limit infrastructure deployment as commercial and industrial electrification increases. (A75, A76-A77) • Coordinate project scopes with other EPIC Administrators and the CEC to avoid duplication. (A76)

Safety Systems and Hazard Response

WHAT PROBLEM ARE WE SOLVING? A81

Large-scale commercial and industrial electrification depends on utilities' ability to safely deploy, energize, and maintain growing amounts of infrastructure. Limited real-time awareness of worker and field conditions can delay safe field execution as electrification work and other dynamic hazards increase operational complexity. Safety Systems and Hazard Response addresses this gap by evaluating technologies that provide real-time hazard detection, situational awareness, and decision support to improve the safety, consistency, and scalability of infrastructure deployment supporting commercial and industrial electrification.

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WHAT IS THE DISTINCT RESEARCH APPROACH?	HOW WILL YOU KNOW YOU ARE SUCCESSFUL?	HOW WILL YOU COORDINATE?
• Explore whether continuous, real-time awareness of worker, environmental, and operational hazards can improve field safety beyond traditional observation-based safety practices. (A81) • Evaluate wearable technologies, intelligent sensors, automated hazard detection, and decision-support systems that integrate worker and field-condition monitoring with emergency response, field-work management, and utility operating workflows. (A81) • Establish whether integrated hazard-awareness technologies can create a step change in worker protection, field execution, and emergency response while addressing privacy, cybersecurity, data governance, false alarms, and human-factors requirements. (A81, A83)	• Establish whether real-time hazard-awareness technologies can improve worker protection and decision-making while reducing safety-related delays and deployment costs at utility scale. (A82) • Validate the safety, usability, accuracy, and value of hazard-monitoring technologies while resolving privacy, cybersecurity, data-governance, and false-alarm concerns. (A81, A82) • Primary result: Validated real-time hazard-awareness and response capabilities supporting cost-effective electrification. (A82, A83) • Metrics: Reduction in deployment cost, safety-related incidents, restoration/job completion time. (A82)	• Build on EPIC 3 hazard-data integration and automated-detection efforts by advancing from planning and forecasting tools toward real-time hazard awareness for field crews and system operators. (A82) • Coordinate evaluations of worker acceptance, privacy, cybersecurity, data-governance, and human-factors requirements to address key barriers to broader deployment of hazard-awareness technologies. (A81, A83) • Coordinate project scopes with other EPIC Administrators and the CEC to avoid duplication. (A82)