Instructions and Summary

Award Number: _____ **Date of Submission:** _____

Award Recipient: **Form submitted by:**

(b) (4)

(b) (4)

b. Fringe Benefits

(b) (4)

c. Travel

INSTRUCTIONS - PLEASE READ!!!

1. Identify Foreign and Domestic Travel as separate items. Examples of Purpose of Travel are subrecipient site visits, DOE meetings, project mgmt. meetings, etc. Examples of Basis for Estimating Costs are past trips, travel quotes, GSA rates, etc.

2. All listed travel must be necessary for performance of the Statement of Project Objectives.

3. Federal travel regulations are contained within the applicable cost principles for all entity types. Travel costs should remain consistent with travel costs incurred by an organization during normal business operations as a result of the organizations written travel policy. In absence of a written travel policy, organizations must follow the regulations prescribed by the General Services Administration.

4. Each budget period is rounded to the nearest dollar.

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d. Equipment

INSTRUCTIONS - PLEASE READ!!!

1. Equipment is generally defined as an item with an acquisition cost greater than $5,000 and a useful life expectancy of more than one year. Please refer to the applicable Federal regulations in 2 CFR 200 for specific equipment definitions and treatment.

2. List all equipment below, providing a basis of cost (e.g. vendor quotes, catalog prices, prior invoices, etc.). Briefly justify items as they apply to the Statement of Project Objectives. If it is existing equipment, provide logical support for the estimated value shown.

3. During award negotiations, provide a vendor quote for all equipment items over $50,000 in price. If the vendor quote is not an exact price match, provide an explanation in the additional explanation section below. If a vendor quote is not practical, such as for a piece of equipment that is purpose-built, first of its kind, or otherwise not available off the shelf, provide a detailed engineering estimate for how the cost estimate was derived.

4. Each budget period is rounded to the nearest dollar.

SOPO Task #	Equipment Item	Qty	Unit Cost	Total Cost	Basis of Cost	Justification of need
Budget Period 1						

(b) (4)

e. Supplies

INSTRUCTIONS - PLEASE READ!!!

1. Supplies are generally defined as an item with an acquisition cost of $5,000 or less and a useful life expectancy of less than one year. Supplies are generally consumed during the project performance. Please refer to the applicable Federal regulations in 2 CFR 200 for specific supplies definitions and treatment.

2. List all proposed supplies below, providing a basis of costs (e.g. vendor quotes, catalog prices, prior invoices, etc.). Briefly justify the need for the Supplies as they apply to the Statement of Project Objectives. Note that Supply items must be direct costs to the project at this budget category, and not duplicative of supply costs included in the indirect pool that is the basis of the indirect rate applied for this project.

3. Multiple supply items valued at $5,000 or less used to assemble an equipment item with a value greater than $5,000 with a useful life of more than one year should be included on the equipment tab. If supply items and costs are ambiguous in nature, contact your DOE representative for proper categorization.

4. Add rows as needed. If rows are added, formulas/calculations may need to be adjusted by the preparer.

5. Each budget period is rounded to the nearest dollar.

(b) (4)

f. Contractual

INSTRUCTIONS - PLEASE READ!!!

1. The entity completing this form must provide all costs related to subrecipients, vendors, and FFRDC partners in the applicable boxes below.

2. Subrecipients (partners, sub-awardees): Subrecipients shall submit a Budget Justification describing all project costs and calculations when their total proposed budget exceeds either (1) $100,000 or (2) 50% of total award costs. These subrecipient forms may be completed by either the subrecipients themselves or by the preparer of this form. The budget totals on the subrecipient's forms must match the subrecipient entries below. A subrecipient is a legal entity to which a subaward is made, who has performance measured against whether the objectives of the Federal program are met, is responsible for programmatic decision making, must adhere to applicable Federal program compliance requirements, and uses the Federal funds to carry out a program of the organization. All characteristics may not be present and judgment must be used to determine subrecipient vs. vendor status.

3. Vendors (including contractors): List all vendors and contractors supplying commercial supplies or services used to support the project. For each Vendor cost with total project costs of $250,000 or more, a Vendor quote must be provided. A vendor is a legal entity contracted to provide goods and services within normal business operations, provides similar goods or services to many different purchasers, operates in a competitive environment, provides goods or services that are ancillary to the operation of the Federal program, and is not subject to compliance requirements of the Federal program. All characteristics may not be present and judgment must be used to determine subrecipient vs. vendor status.

4. Federal Funded Research and Development Centers (FFRDCs): FFRDCs must submit a signed Field Work Proposal during award application. The award recipient may allow the FFRDC to provide this information directly to DOE, however project costs must also be provided below.

5. Each budget period is rounded to the nearest dollar.

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g. Construction

PLEASE READ!!!

1. Construction, for the purpose of budgeting, is defined as all types of work done on a particular building, including erecting, altering, or remodeling. Construction conducted by the award recipient is entered on this page. Any construction work that is performed by a vendor or subrecipient should be entered under f. Contractual.

2. List all proposed construction below, providing a basis of cost such as engineering estimates, prior construction, etc., and briefly justify its need as it applies to the Statement of Project Objectives.

3. Each budget period is rounded to the nearest dollar.

Overall description of construction activities: Example Only!!! - Build wind turbine platform

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h. Other Direct Costs

INSTRUCTIONS - PLEASE READ!!!

1. Other direct costs are direct cost items required for the project which do not fit clearly into other categories. These direct costs must not be included in the indirect costs (for which the indirect rate is being applied for this project). Examples are: tuition, printing costs, etc. which can be directly charged to the project and are not duplicated in indirect costs (overhead costs).

2. Basis of cost are items such as vendor quotes, prior purchases of similar or like items, published price list, etc.

3. Each budget period is rounded to the nearest dollar.

SOPO Task #	General Description and SOPO Task #	Cost	Basis of Cost	Justification of need
	Budget Period 1			

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Additional Explanation (as needed):

i. Indirect Costs

INSTRUCTIONS - PLEASE READ!!!

1. Fill out the table below to indicate how your indirect costs are calculated. Use the box below to provide additional explanation regarding your indirect rate calculation.

2. The rates and how they are applied should not be averaged to get one indirect cost percentage. Complex calculations or rates that do not do not correspond to the below categories should be described/provided in the Additional Explanation section below. If questions exist, consult with your DOE contact before filling out this section.

3. The indirect rate should be applied to both the Federal Share and Recipient Cost Share.

4. Each budget period is rounded to the nearest dollar.

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A federally approved indirect rate agreement, or rate proposed (supported and agreed upon by DOE for estimating purposes) is required if reimbursement of indirect costs is requested. Please check (X) one of the options below and provide the requested information if it has not already been provided as requested, or has changed.

_____ An indirect rate has been approved or negotiated with a federal government agency. A copy of the latest rate agreement is included with this application, and will be provided electronically to the Contracting Officer for this project.

_____ There is not a current, federally approved rate agreement negotiated and available*.

***When this option is checked, the entity preparing this form shall submit an indirect rate proposal in the format provided by your DOE contact, or a format that provides the same level of information and which will support the rates being proposed for use in performance of the proposed project. Additionally, any non-Federal entity that has never received a negotiated indirect cost rate, except for those non-Federal entities described in Appendix VII to Part 200—States and Local Government and Indian Tribe Indirect Cost Proposals, paragraph D.1.b, may elect to charge a de minimis rate of 10% of modified total direct costs (MTDC) which may be used indefinitely.As described in §200.403 Factors affecting allowability of costs, costs must be consistently charged as either indirect or direct costs, but may not be double charged or inconsistently charged as both. If chosen, this methodology once elected must be used consistently for all Federal awards until such time as a non-Federal entity chooses to negotiate for a rate, which the non-Federal entity may apply to do at any time.**

You must provide an explanation (below or in a separate attachment) and show how your indirect cost rate was applied to this budget in order to come up with the indirect costs shown.

Additional Explanation (as needed): *IMPORTANT: Please use this box (or an attachment) to further explain how your total indirect costs were calculated. If the total indirect costs are a cumulative amount of more than one calculation or rate application, the explanation and calculations should identify all rates used, along with the base they were applied to (and how the base was derived), and a total for each (along with grand total).

Cost Share

PLEASE READ!!!

1. A detailed presentation of the cash or cash value of all cost share proposed must be provided in the table below. All items in the chart below must be identified within the applicable cost category tabs a. through i. in addition to the detailed presentation of the cash or cash value of all cost share proposed provided in the table below. Identify the source organization & amount of each cost share item proposed in the award.

2. Cash Cost Share - encompasses all contributions to the project made by the recipient, subrecipient, or third party (an entity that does not have a role in performing the scope of work) for costs incurred and paid for during the project. This includes when an organization pays for personnel, supplies, equipment, etc. for their own company with organizational resources. If the item or service is reimbursed for, it is cash cost share. All cost share items must be necessary to the performance of the project. Any partial donation of goods or services is considered a discount and is not allowable.

3. In Kind Cost Share - encompasses all contributions to the project made by the recipient, subrecipient, or third party (an entity that does not have a role in performing the scope of work) where a value of the contribution can be readily determined, verified and justified but where no actual cash is transacted in securing the good or service comprising the contribution. In Kind cost share items include volunteer personnel hours, the donation of space or use of equipment, etc. The cash value and calculations thereof for all In Kind cost share items must be justified and explained in the Cost Share Item section below. All cost share items must be necessary to the performance of the project. If questions exist, consult your DOE contact before filling out In Kind cost share in this section. Vendors may not provide cost share. Any partial donation of goods or services is considered a discount and is not allowable.

4. Funds from other Federal sources MAY NOT be counted as cost share. This prohibition includes FFRDC sub-recipients. Non-Federal sources include any source not originally derived from Federal funds. Cost sharing commitment letters from subrecipients and third parties must be provided with the original application.

5. Fee or profit, including foregone fee or profit, **are not allowable** as project costs (including cost share) under any resulting award. The project may only incur those costs that are allowable and allocable to the project (including cost share) as determined in accordance with the applicable cost principles prescribed in FAR Part 31 for For-Profit entities and 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

6. NOTE: A Recipient who elects to employ the 10% de minimis Indirect Cost rate **cannot claim the resulting indirect costs as a Cost Share contribution.**

7. NOTE: A Recipient **cannot claim "unrecovered indirect costs"** as a Cost Share contribution, **without prior approval.**

8. Each budget period is rounded to the nearest dollar.

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Additional Explanation (as needed):

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[redacted]

COVER PAGE

Project Title
Accelerating building thermal electrification while managing system impacts

Specific FOA Topic Area
DE-FOA-0002740, Topic Area 2: Smart Grid Grants (40107)

Technical Point of Contact
Michael Goldman (608-213-3570); mgoldman@generacgs.com

Business Point of Contact
Anne Hoskins (414-363-0475); anne.hoskins@generac.com

Team Member Organizations
Generac Grid Services
Interstate Renewable Energy Council (IREC)
Fraunhofer USA, Building Energy Systems
Cape Light Compact
Unitil
Eversource Energy
National Grid
Massachusetts Clean Energy Center (project collaborator, not official project partner)
Action for Boston Community Development (ABCD)

Key Personnel
Michael Goldman/Gavin Hume – Generac Grid Services
Dr. Kurt Roth – Fraunhofer Center
Kristen Hagerty – Interstate Renewable Energy Council
James Collins – Action for Boston Community Development

Project Locations
This project will operate in Massachusetts, focusing on disadvantaged communities as identified by the Justice40 Initiative.

Confidentiality
Please treat the Innovations and Impacts section and all budgets as confidential. The rest of the application does not contain any confidential information.

PROJECT OVERVIEW

Background: Generac Power Systems, Inc. (Generac) is a leading energy technology company providing advanced power grid software solutions, backup and prime power systems for home and industrial applications, solar + battery storage solutions, and virtual power plant (VPP) and distributed energy resource management system (DERMS) aggregation and control platforms. Generac offers a wide array of power products suitable as grid-tied distributed energy resources (DER) assets, controllable and dispatchable by way of the Concerto™ VPP/DERMS software platform. Generac subsidiary Generac Grid Services (GGS) will be acting in a lead capacity for this project.

The GGS team has extensive experience developing projects that involve aggregating behind the meter assets into a DERMS platform and dispatching those assets for various operational objectives. A limited number of illustrative examples are provided in the Technical Qualifications and Resources section which highlight similar experiences aggregating and deploying multi-asset VPPs with numerous major utilities across the country such as Portland General Electric and Eversource Energy.

According to the EPA, ~42% of energy in residential buildings is used for space heating[1]. Reducing emissions from the residential space heating sector is critical in meeting climate objectives. The proposed project is unique in many ways and will increase the collective baseline on how to electrify the building thermal sector while minimizing electric system infrastructure impacts, while ensuring that all customer classes are included in the electrification evolution. One critical outcome of the project is to demonstrate how to mitigate electric peaks caused specifically from heat pumps due to their unique load profile without compromising customer comfort and utility. This will require developing battery dispatch strategies that can follow electric demand from heat pumps that change depending on weather/temperature conditions. In order to have maximum impact, it will be critical to optimize multiple smaller DERs within individual households. This project will also seek to develop best practices in encouraging low and moderate (LMI) customers to install DERs and participate in load control programs. This will be done through extensive engagement through community-based organizations.

Project Goal: This project will offer ~2,000 income eligible participants a combination of Generac PWRCell home battery systems, ecobee thermostats paired with heat pumps, and hot water heater load control switches (if applicable). The goal is to demonstrate that efficient building electrification can be done while minimizing system overloads, reliability issues, and minimizing the need for infrastructure upgrades. This project will use Generac's Concerto Distributed Energy Resource Management System (DERMS) to send control signals to heat

[1] https://www.epa.gov/rhc/renewable-space-heating#:~:text=About%20Space%20Heating,-Space%20heating%20is&text=Recent%20data%20suggest%20that%20space,use%20in%20U.S.%20commercial%20buildings.

pumps, thermostats, water heating load control switches, and batteries to minimize and optimize the impacts of new heating and transportation electrification load on the grid.

DOE Impact: DOE funding will provide the additional funding needed to accelerate the deployment of heat pumps and batteries to the target population, who would otherwise not participate in a market rate program. A demonstration project of this scale will signal to utilities, energy efficiency program administrators and other stakeholders that efficient thermal electrification can be deployed and managed in a way that does not present a risk to the electric system, does not materially increase energy costs, and does not compromise customer's comfort.

The DOE funding is essential in the following ways:

- Offset cost of equipment to be installed in low-to-moderate income (LMI) households
    - LMI customers will be the primary focus of this project with the expectation that success with this segment will lead to best practices that can be equally applied to market rate customers to optimize scaling.
- Provide community benefits through workforce development and lowering energy burden. This is described in greater detail in the Community Benefits Plan.

At a high level, DOE funding for this project will have a catalytic impact on the industry by conclusively showing the value that orchestrating a portfolio of DERs can have in mitigating the impact of increased electrification. The results of this program will encourage utilities and other program administrators to provide incentives to customers for the control of customer-sited assets in a vein similar to what is being proposed in this project. This creates a virtuous and sustainable cycle where customers are encouraged to install more batteries and other smart building technologies to help provide flexible capacity. Participating customers will benefit from the utility incentives and the resilience provided by the batteries. Customers that are on a time-of-use (TOU) rate may also benefit from rate arbitrage. The utilities in turn benefit from the flexible load and the value it provides in increasing system resilience and reducing the need for upgrades. The benefits from reduced infrastructure and energy costs resulting from the aggregation and dispatch of the DERS will accrue to all customers regardless of whether they directly participate in the program or not.

Community Benefits Plan: The project's utility and energy efficiency program administrator partners have a long history of deep community involvement. This engagement comes from decades of working together with local leaders to help ensure delivery of consistent electric and energy efficiency services. The project team anticipates working closely with community action agencies, workforce trainers, and other local municipal agencies to identify how we can have the biggest impact in the community. Our shared goal is to identify the most vulnerable customers that could potentially benefit the most from the offering.

Workforce development and job creation are vital to the success of the proposed project. IREC is an industry leader in workforce development and is a partner in this project. IREC will be advising the project team on local organizations to partner with and providing overall strategic

direction on workforce development and training best practices. With the help of IREC and local partners, the project team will work closely to:

- Structure training and employment opportunities including on-the-job training, apprenticeships, and strategies for workers to gain credentials for advancement;
- Prioritize outreach to Minority/Women Owned Business Enterprises (MWBE) contractors for program inclusion; and
- Coordinate information sessions and recruitment events with local community colleges, trade techs, and at public housing locations.

The team will maintain communications with local workforce development boards and other stakeholders to ensure that workforce development and job creation portions of the plan are executed at a high level and have an outsized focus on historically underserved populations.

Sharing and maximizing benefits across disadvantaged communities: This project will develop a replicable model that can be scaled to communities across the country. While this project is slated to take place in Massachusetts, one of the project partners, IREC, is a national organization. The learnings gathered from this project, specifically how to create resiliency and decarbonization for LMI populations in a scalable way, and how to build/train the workforce necessary to do it, will be disseminated more broadly. This will be achieved through other workforce development programs and engagement from IREC. Additionally, the Energy Systems Team at the Fraunhofer USA Center for Manufacturing Innovation will use project results to develop technical evaluations that can be broadly shared.

The project will engage and align with local community leaders to develop a plan that brings many benefits such as increased resiliency and job opportunities to the communities where the project will operate. The primary goal being to identify and establish communication with the most vulnerable customers that will benefit most from the offering. To reach this goal, the project team will leverage the existing community involvement that the utility and energy efficiency program administrator partners have cultivated. They have spent decades working in tandem with local community leaders to ensure the delivery of consistent electric and energy efficiency services. The project team will utilize this foundation to energize community action agencies, workforce trainers, and other local municipal agencies to ensure that the community is engaged in the most efficient way possible.

Potential long-term constraints on access to natural resources: This project should not present any long-term constraints to a community's access to natural resources and/or Tribal cultural resources. Relative to business-as-usual, it should increase access to open space by decreasing the need for traditional grid infrastructure investments in space-constrained environments.

Climate resilience strategy: The proposed project is specifically designed to provide resilience for customers as extreme weather patterns become more common and by increasing network reliability. By providing customers with batteries, customers will have a source of backup power that will help them ride through any potential outages caused by extreme weather.

TECHNICAL DESCRIPTION, INNOVATION, AND IMPACT

Relevance and Outcomes: The need to rapidly decarbonize all sectors of the economy becomes more imperative each passing day as we see the increasing impacts of climate change. Technology currently exists to reduce the need to use fossil fuels in the electric generation, transportation, and building thermal sectors. While this technology is commercially available today, there are potentially negative consequences of adding large amounts of new electric load on the transmission and distribution (T&D) system through the rapid electrification of the transportation and building thermal sectors. As the country transitions away from fossil fuel-based furnaces and boilers to efficient electric heat pumps, new T&D infrastructure may be needed to support this new load unless it can be managed. As an example, recent research from UC-Berkeley suggests that electrification in Pacific Gas & Electric's (PG&E) California service territory will require the utility to triple the rate of feeder upgrades at an additional total cost of $1 billion by 2030[2].

Load growth from resources like heat pumps will only grow over time. The Inflation Reduction Act (IRA) provides tax incentives for people to install heat pumps. This will accelerate adoption of these devices, requiring infrastructure upgrades to accommodate the new electric load. Increased demand for electricity may also put upward pressure on energy prices if electric supply cannot keep pace with demand. It may be necessary to rely on less efficient, higher CO_2 emitting power plants to meet the marginal demand created by more heat pumps.

This project will show how it is possible to electrify the building thermal sector while increasing customer and system reliability by using aggregated distributed energy resources controlled through a distributed energy resource management system (DERMS). The goal of this project is to minimize the potential negative impacts of heating electrification on the reliability of the distribution system while avoiding the need to build new infrastructure and simultaneously helping to accelerate the deployment of smart building solutions that will be critical in reducing GHG emissions.

The project will focus on several interrelated use cases, briefly described below:

- Reduce forecasted winter morning peaks at the ISO-NE level by 5 kW per battery or approximately 10 MW when all ~2,000 planned batteries are installed by dispatching the batteries at the same time as heat pumps are calling for electricity
    - Subsequent phases of this project may more specifically analyze impacts at the distribution system level
- Use a fleet of batteries to soak up excess solar production during light load conditions, helping to mitigate reverse power flow
- Co-optimize the battery fleet to also participate in the Massachusetts Program Administrator's ConnectedSolutions Program, which focuses on reducing the current coincident ISO NE peak hour in the summer

[2] *What Will Electrification Cost (the Distribution System)*, available at https://energyathaas.wordpress.com/2022/06/27/what-will-electrification-cost-the-distribution-system/

The initial focus of the project team will be on low to moderate income customers living in owner-occupied single-family homes. The team will engage with low-income advocates in the energy space and community action agencies to identify and recruit target customers. The project will use a community-based outreach model to engage LMI households both as customers and as workforce development participants. The Cape Light Compact's Cape and Vineyard Electrification Offering (CVEO) provides a rough template of how the offering and process could work[3]. We believe it is critical to start with the LMI customer population, which is too often left behind when new technology is being implemented.

This project will address many of the topic area's priorities through the inclusion of multiple eligible uses and technical approaches. One of the topic area's key objectives is to "facilitate the aggregation and integration (edge-computing) of electric vehicles and other grid-edge devices or electrified loads." This project will meet this objective by aggregating heat pumps via wi-fi thermostats, batteries, and water heating load control switches and manage those devices so that customer comfort is not impacted while also ensuring that any increase in peak demand caused by the new electrified load is balanced. The balanced peak load will provide increased reliability in the system and reduce the possibility of thermal overloads or other demand related issues when customers would be most vulnerable, such as during periods of extreme temperatures. Load balancing will occur through changing set points on heating systems and charging/discharging batteries in near-real time as load fluctuates. This project will show that the need for infrastructure upgrades, or the activation of less efficient peaker plants can be mitigated through the use of intelligent DER orchestration.

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The project partners responsible for the various stages of the project are ready to execute upon project award. The basic implementation strategy is predicated on using existing energy efficiency delivery pathways to install additional equipment in a customer's home. Specific details of the deployment are described below.

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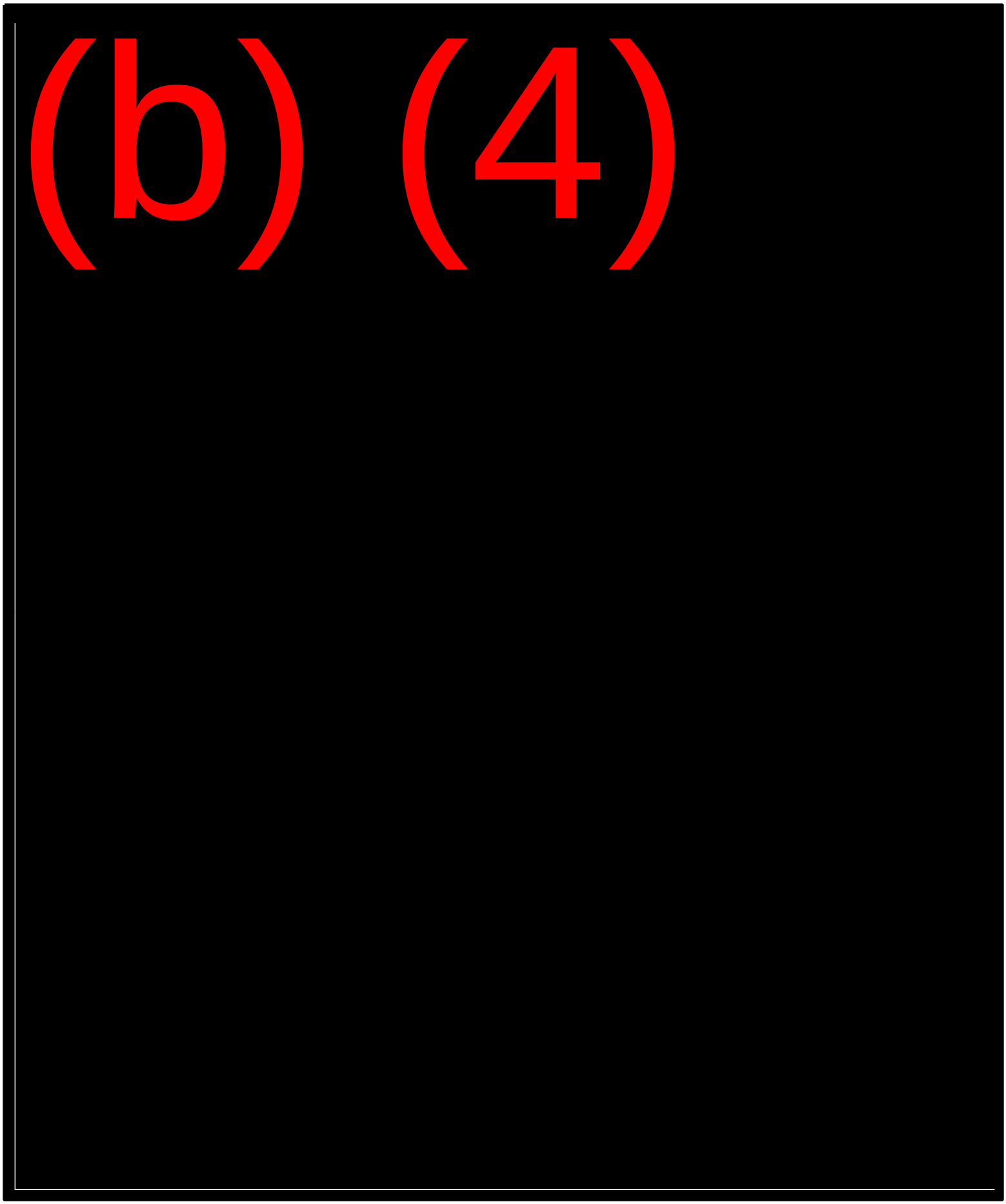
- Installation – Initial installation will be handled through the existing network of Generac installation partners in close coordination with other project team members. Generac's Clean Energy group has thousands of installation partners across the country that specialize in battery installation. One goal of the program is to help train additional installation contractors. This project will focus on using Women Businesses Enterprises (WBE) and Minority Businesses Enterprises (MBE) to the greatest extent possible.
- Control - Real time monitoring of ISO load and the underlying DERs that will be part of this project (i.e. heat pumps, batteries, load control switches) can be done either through the Generac Grid Services Network Operations Center (NOC) and/or utility control room. Similarly, the dispatch and control of these assets can be done through the NOC or utility control room.

[redacted]

[4] Cadmus Group, Evaluation of Cold Climate Heat Pumps in Vermont, November 2017, available at https://publicservice.vermont.gov/sites/dps/files/documents/Energy_Efficiency/Reports/Evaluation%20of%20Cold%20Climate%20Heat%20Pumps%20in%20Vermont.pdf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Supporting Decarbonization, resilience, other energy goals: On June 30th, 2022 Massachusetts released its Clean Energy and Climate Plan (CECP)[7] for 2025 and 2030, setting out pathways for

[7] Massachusetts Clean Energy and Climate Plan for 2025 and 2030, available at https://www.mass.gov/doc/clean-energy-and-climate-plan-for-2025-and-2030/download

achieving deep decarbonization goals and eventually bringing the Commonwealth to Net Zero by 2050. Table 1 below shows the historical and needed future reductions in emissions from the residential heating and cooling sector to meet Massachusetts's statewide goals.

Table 1.

Residential Heating and Cooling	1990	2010	2015	2020	2025	2030
Gross Emissions (MMTCO2e)	15.3	13.7	13.6	12.2	10.8	7.8
% Reduction (Increase) from 1990		10%	11%	20%	29%	49%

The CECP specifically calls out building thermal electrification through the installation of heat pumps as a primary driver for obtaining the needed emissions reductions from the residential heating and cooling sector. The CECP states that "While there is a focus on reducing energy demand of buildings, many technologies allow Massachusetts consumers to transition away from fossil fuels as a source of energy. In particular, heat pump systems can accommodate a wide range of building system needs with much greater efficiency than combustion based heating systems, reducing a building's total energy use." Getting technology like heat pumps into people's homes at scale has proven challenging so far and the CECP concedes that the best delivery mechanism for these programs is the Massachusetts utilities and energy efficiency Program Administrators that jointly run the Mass Save energy efficiency programs. The CECP states that "Mass Save is currently the best resourced and farthest-reaching policy tool that the Commonwealth can leverage to achieve GHG emissions reductions from the Buildings sector."

This project will utilize the existing Mass Save program delivery pathways to help offer additional equipment to residents in addition to heat pumps such as batteries, wi-fi thermostats, and water heater control switches. This project should align with statewide decarbonization and resiliency plans in multiple ways discussed below:

1. **Accelerate deployments of heat pumps through the Mass Save program in alignment with the CECP.** By adding an offer of free battery (paid for through the GRIPs grant) to the existing Mass Save offer of a no cost or heavily subsidized heat pump, program participation should see an uptick. The overall customer proposition becomes more compelling when a battery is added to a heat pump, convincing more people to install heat pumps. Adding a battery also allows a customer to earn additional revenue through the existing ConnectedSoltuons demand response program.
2. **Increase solar self-consumption**. When the batteries aren't being used to offset the load from the heat pumps, they can be used for other purposes, such as solar self-consumption. This is especially important in New England where the largest source of electric generation is natural gas.
3. **Increase resilience at the household level.** This project will provide batteries to LMI customers in addition to heat pumps. In many instances, LMI customers may not have been able to afford and install batteries without this grant funding. Batteries will provide resilience at the individual household level, such as providing back up power for life saving health equipment such as sleep apnea machines and oxygen mchines.

4. **Increase resilience at the system level.** The fleet of batteries and other controllable DERs from this project will be aggregated into Virtual Power Plants (VPPs) that will be dispatched when there are possible constraints on the electric system. This should help increase resilience at the system level. Additionally, these VPPs can be dispatched when inefficient power plants are running, helping to lower emissions in that manner as well.

Potential Impact of the project to reduce perceived risk, achieve further deployment at scale: This project can help reduce innovation risk, achieve further deployment at scale, and attract additional private sector investment into this area. This project will show that aggregating multiple types of smart-grid technologies together can provide very specific value, such as enhancing resilience to both customers and to the grid, and potentially reducing operational costs. This should help to allay concerns that grid operators might have about heat pumps and batteries. In turn this should help reduce barriers to installation and may also lead to enhanced incentive levels from utility and energy efficiency program administrators for these types of connected devices because of the value they can bring for the system operator. In this way, this project will demonstrate the value of aggregated resources in mitigating impacts from electrification, will encourage accelerated deployment of smart grid technologies, and reduce innovation risk. No less importantly we will also demonstrate that this type of project can scale with LMI customers as key stakeholders.

Significant Effect in Encouraging Smart Grid Functions: The overall goal of this project is to demonstrate that it is possible to mitigate peak demand caused by rapid heating electrification and also to provide additional grid benefits as well. While the term “grid” can refer to several different aspects of the overall electric system, this project should produce benefits at the distribution system level and potentially in electric wholesale markets as well.

From the distribution system perspective, we expect that this project would show that using aggregated batteries and heat pumps and load control switches could defer the need for system upgrades, extend the life of existing distribution assets, and increase overall system reliability by reducing risk of thermal overload or other equipment failure, like voltage control systems. From the wholesale market perspective, the project will demonstrate that less capacity will need to be procured due to better utilization of existing capacity, leading to lower rates for customers. By tackling potential peak demand issues, it may be possible to reduce the need to run peaking plants that are usually last in the dispatch stack and are the most inefficient plants that produce the highest emissions. It may also be possible to alleviate renewable curtailment by increasing hosting capacity. Finally, the goal would also be to reduce utility exposure to high energy costs, which will flow down to both participating and non-participating customers and have a disproportionate impact on the most vulnerable customers.

Describe how project would enhance system flexibility to meet program objectives: This project will address many of the topic area’s priorities through the inclusion of multiple eligible uses and technical approaches.

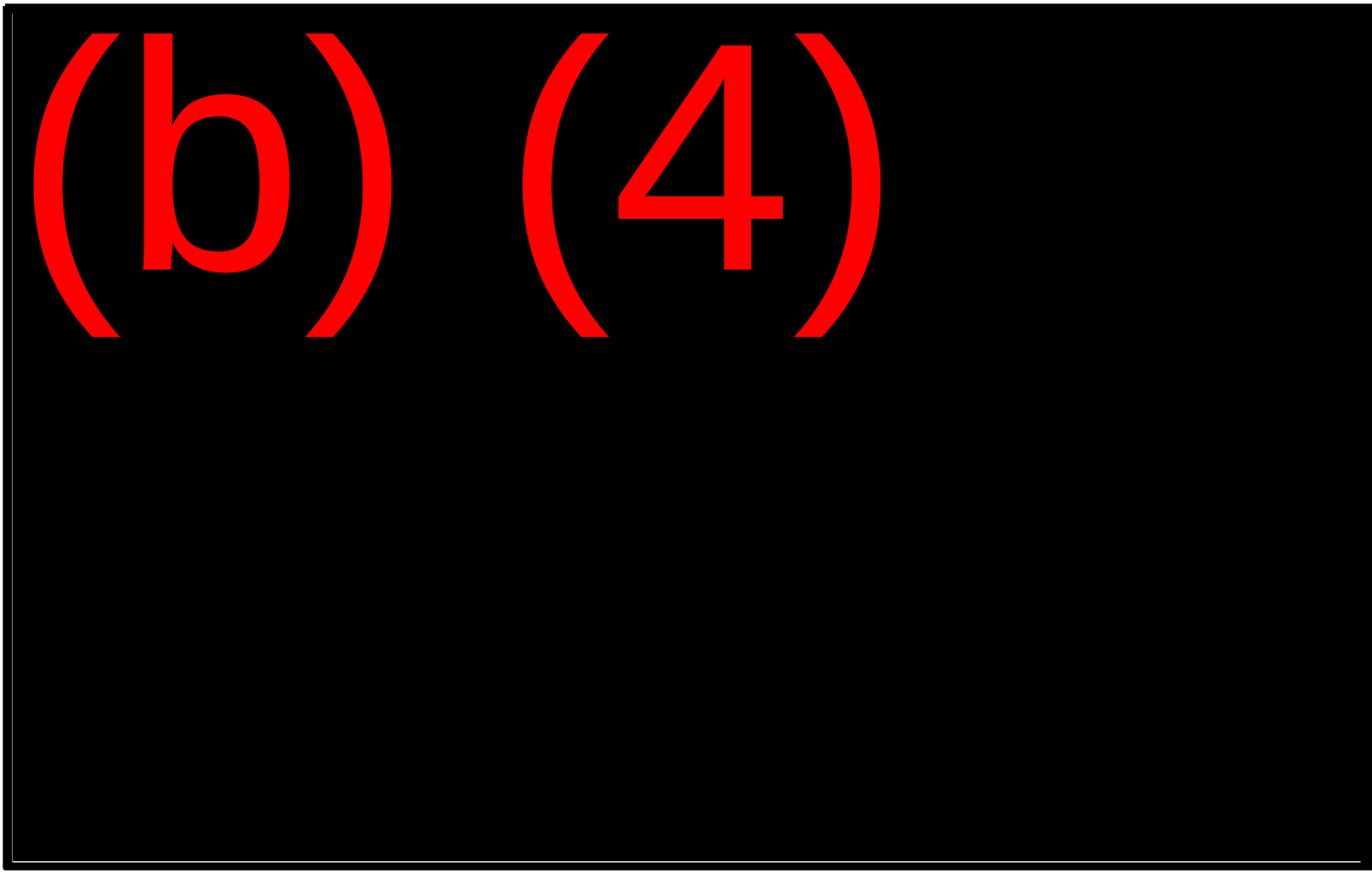
One of the topic area's key objectives is to "facilitate the aggregation and integration (edge-computing) of electric vehicles and other grid-edge devices or electrified loads." This project will meet that objective by aggregating multiple grid-edge devices and electrified loads. Specifically, this project will control heat pumps (through wi-fi thermostats), batteries, and water heating load control switches and operate those devices to maximize customer comfort while also smoothing out peak demand caused by new electrified loads like heat pumps. Smoothing peak load will have the beneficial impact of creating increased reliability in the system and reduce the risk of thermal overloads or other demand related issues during times when customers may be most vulnerable, i.e. extreme cold or heat. This project seeks to validate that it is possible to coordinate multiple different assets to achieve a single objective at scale. While individual assets are currently used in demand response programs, these assets are usually utilized in an "all call" fashion, which is to say that the assets are all dispatched at the same time to give as much capacity relief as possible at once. This project will demonstrate that it is possible to coordinate multiple different assets, working together, to minimize the new electric demand from heat pumps that are drawing power from the grid at the same time, potentially requiring expensive infrastructure upgrades or threatening reliability.

Additionally, this project may be able to help reduce clean energy curtailment. When not being dispatched in the morning for winter peaking systems, batteries can be directed to charge during times of excess solar production, typically mid-day.

This project fits squarely in the DOE's priority investment area of "Aggregation and integration of distributed energy resources and other "grid edge" devices to provide system benefits, such as renewable energy resources, electric vehicle charging infrastructure, vehicle-to-grid technologies and capabilities, and smart building technologies." Funding from this grant will be used to procure and install smart building technologies such as wi-fi thermostats, batteries, and load control switches in residential homes. Additionally, distributed energy resource management system (DERMS) software will be used to aggregate and integrate these assets into a virtual power plant (VPP) that will be used to provide system benefits like deferring the need for infrastructure upgrades, enhancing resilience, and reducing clean energy curtailments.

WORKPLAN

(b) (4)



This project will be supporting equipment and labor related to providing and installing customer sited behind the meter distributed energy resources. The proposed Prime Recipient is Generac Grid Services, a for-profit entity. Per the language highlighted from the FOA in Appendix C below, the Buy America requirements should not be applicable to this project.

Appendix C
These requirements must flow down to all sub-awards, all contracts, subcontracts and purchase orders for work performed under the proposed project, except where the prime recipient is a for-profit entity. Based on guidance from Office of Management and Budget (OMB) Memorandum M-22-11, the Buy America requirements of the BIL do not apply to DOE projects in which the prime recipient is a for-profit entity; the requirements only apply to projects whose prime recipient is a State, local government, Indian tribe, Institution of Higher Education, or nonprofit organization. (FOA, page 129 of 141).

Technical Scope Summary:
This project will install heat pumps and batteries (and smart thermostats and water heating control switches where possible) in approximately 2,000 LMI homes, commissioning those units and optimizing their integrated control through a distributed energy resource management system (DERMS), performing detailed measurement and verification (M&V), and developing workforce training programs and synthesizing scalable solution packages and best practices. The

project team is comprised of subject matter experts who will execute each part of the scope. At a high level the following project partners will be responsible for implementing a portion of the technical scope:

Generac Grid Services – providing equipment/hardware, commissioning batteries, enrolling assets into DERMs, developing forecasts and optimization algorithms, dispatching assets
Action for Boston Community Development – customer acquisition, on the ground implementation, oversight of implementation efforts
Electric Utilities and Energy Efficiency Program Administrators – provide overall strategic direction for decarbonization efforts, provide resources for heat pumps
Interstate Renewable Energy Council (IREC) – creation and execution of workforce development efforts while working with Massachusetts Clean Energy Center
Fraunhofer Center – development and execution of M&V plans, development of scalable solution packages and best practices

Performance Period 1
All contracts signed between project partners; Development of final offer to customer; Final customer recruitment plan; Training Materials developed; Winter peak forecast developed; Dispatch algorithm developed and finalized; 20 units installed; 10 dispatches from DERMS initiated; M&V plan developed and finalized

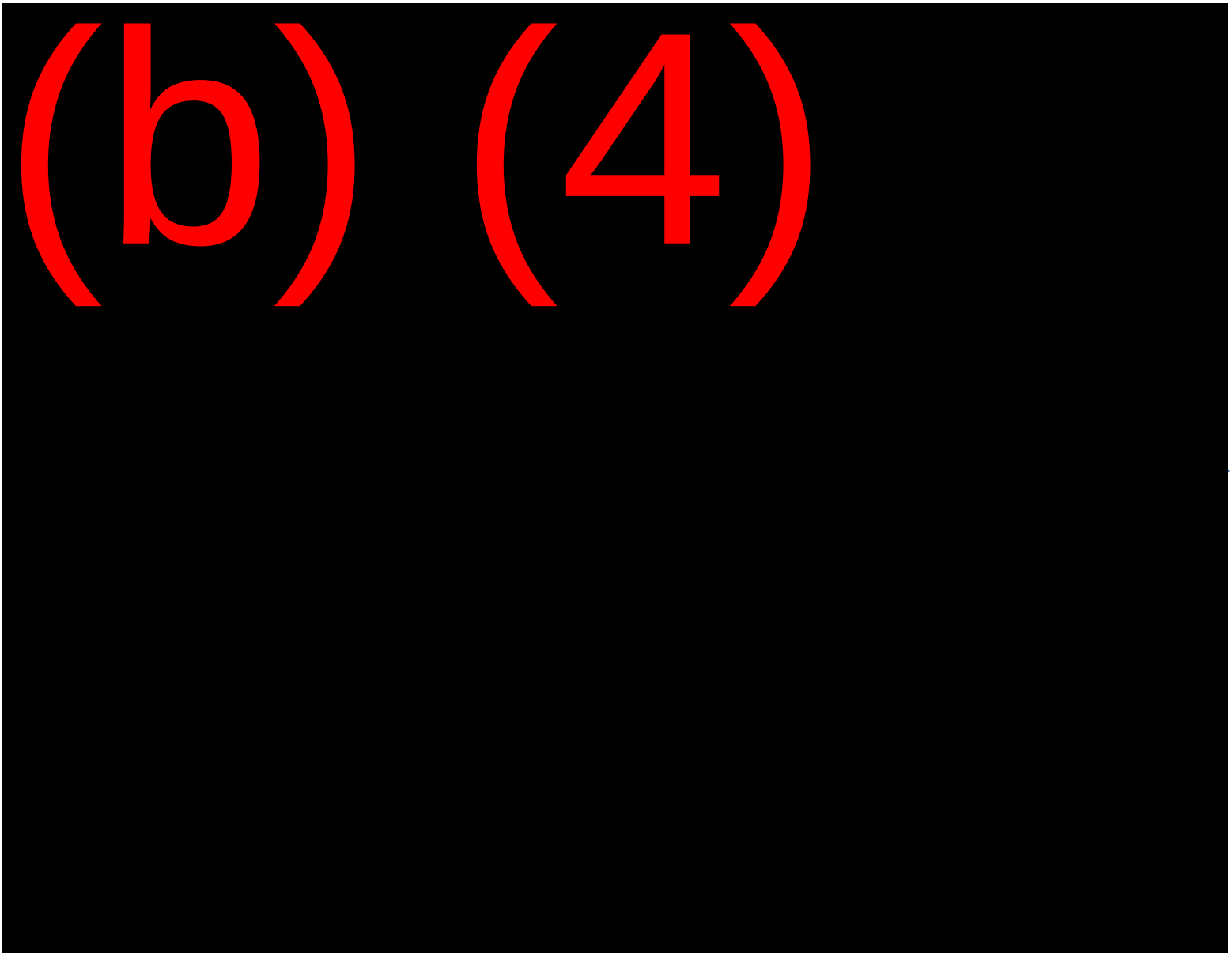
Performance Period 2
255 additional units installed; 60 additional dispatches from DERMS initiated; Workforce development trainings delivered

Performance Period 3
500 additional units installed; 60 additional dispatches from DERMS initiated

Performance Period 4
560 additional units installed; 60 additional dispatches from DERMS initiated

Performance Period 5
560 additional units installed; 60 additional dispatches from DERMS initiated; Evaluation of DER and DERMS performance completed; Scalable solution packages and best practices distilled from field deployments and testing

(b) (4)



Milestone Summary & Go/No Go Decision Points:

Activity	**Period 1**			
	Q1	Q2	Q3	Q4
Signed Agreements	0	0	20	30
Installs	0	0	0	20
Dispatches	0	0	0	10
				GO/NO GO
	Period 2			
	Q1	Q2	Q3	Q4
Signed Agreements	50	75	100	110
Installs	30	50	75	100
Dispatches	15	15	15	15
				GO/NO GO

	Period 3			
	Q1	Q2	Q3	Q4
Signed Agreements	130	130	130	140
Installs	110	130	130	130
Dispatches	15	15	15	15
				GO/NO GO
	Period 4			
	Q1	Q2	Q3	Q4
Signed Agreements	140	140	140	140
Installs	140	140	140	140
Dispatches	15	15	15	15
				GO/NO GO
	Period 5			
	Q1	Q2	Q3	Q4
Signed Agreements	140	140	140	140
Installs	140	140	140	140
Dispatches	15	15	15	15
			GO/ NO GO	

Period	**Installs**
Period 1	20
Period 2	255
Period 3	500
Period 4	560
Period 5	560
Total Installs	**1895**

Definitions –
Signed Agreement: A signed agreement is when a customer commits to having a heat pump and battery (and other DERs) installed in their home.
Installs: An install represents when equipment is physically installed in a customer's home. For a battery, an install is considered complete when there is an Interconnection Services Agreement (ISA) in place.
Dispatches: A dispatch is when a signal is sent from the DERMS platform to the underlying distributed energy resources. Dispatches will be utilized to change the load profile that the grid sees from each house by controlling heat pumps and batteries.

Go/No Go Decision Points –

We would recommend having a Go/No Go decision point in Q4 of the first four project periods (none needed for the 5th period). For Periods 1 and 2 the Go/NO Go decision will be based off of whether the project achieves at least 60% of any of the SMART milestones. In Periods 3-4, if the project achieves at least 70% of the equipment installs, it should continue forward.

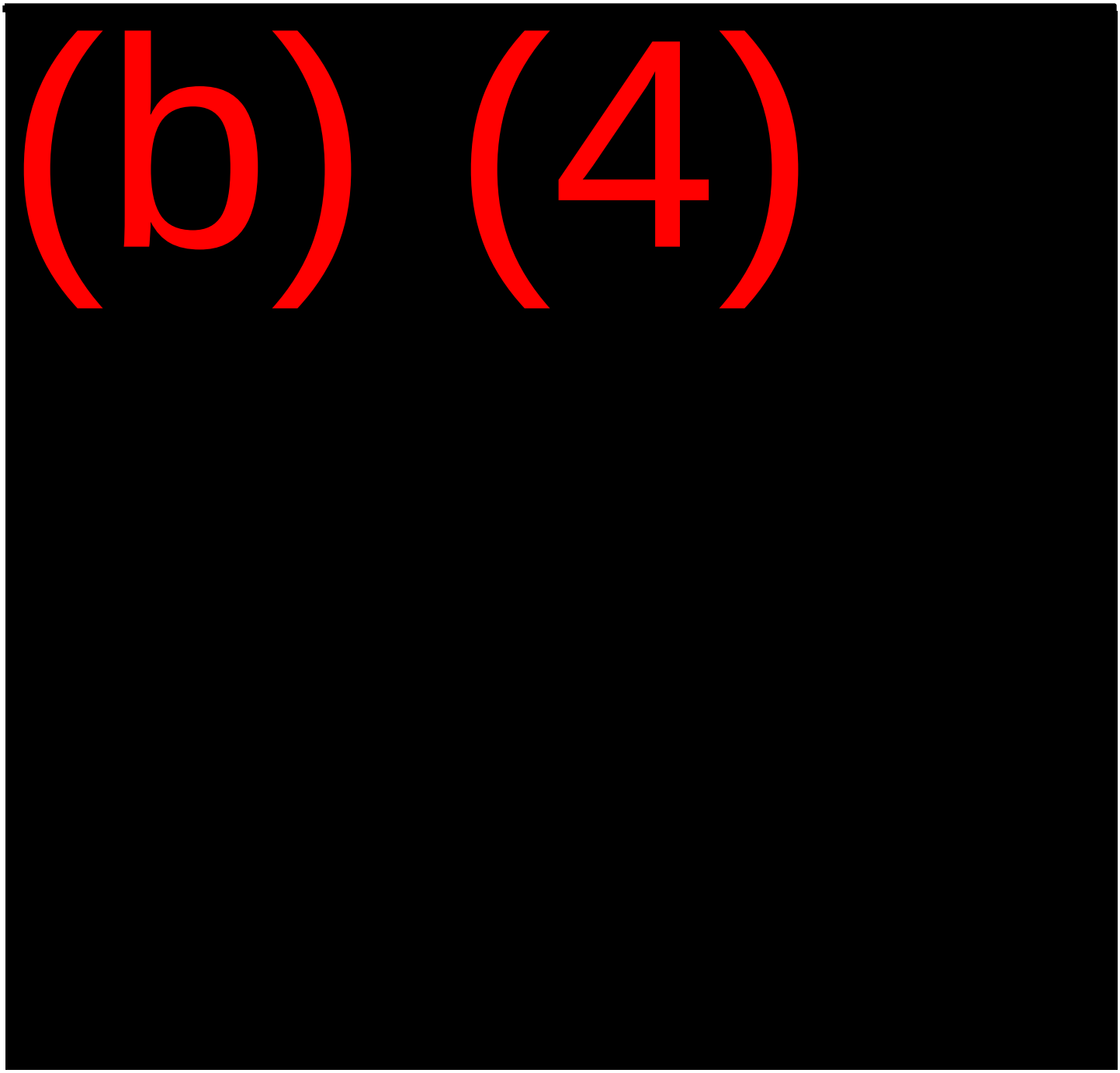
End of Project Goal:
At the end of this project, we will have installed approximately two thousand (2,000) combined heat pump and battery systems with as many additional smart thermostats and hot water control switches as possible. We will have aggregated the heat pumps, smart thermostats, batteries, and water heater control switches into a Distributed Energy Resource Management System (DERMS) and dispatched all of the assets at least ten (10) times per year starting in the second year. This will be done in order to evaluate whether or not controlling the DERs can substantially mitigate the impact of new electric loads from building thermal electrification by controlling them in a coordinated way to reduce grid impacts.

In order to determine the success of the end of project goals, we will be performing extensive measurement and verification (M&V) throughout the duration of the project. In furtherance of this objective, the project team is proposing the following M&V activities:

> Develop M&V Plan; Develop Data Acquisition + Data Collection Plan; Ongoing: Regularly evaluate control performance; Develop a data quality control (QC) screening tool; Conduct Ongoing Data QC; Baseline development: Process pre-retrofit data to develop energy consumption baseline space and water heating baseline estimates for ASHPs and HPWHs; Conduct M&V throughout course of project; Conduct Scenario Analyses: To maximize lessons learned, develop models for the controlled loads based on real-world data and then exercise the model for forward-looking use cases that were not included in the field testing

Additionally, we will have established education for energy auditors to help them identify building thermal electrification opportunities and those households that are good candidates for batteries. The project team will consider developing this education from scratch or leveraging existing systems like Adobe Energy Management. The workforce development efforts will also facilitate career opportunities and advancement for HVAC technicians and electricians through the development of mentorship and retention programs.

(b) (4)



Project Management:
The project will be executed by a team of project partners, with each bringing value based on their existing capabilities. These partners will each have defined scope and roles. The following is high-level summary for each project team member and their responsibilities:

Overall Project Lead: Generac Grid Services (GGS).

GGS will be responsible for managing the overall project development and execution for the entirety of the contract. GGS will be the main point of contact for the project team and will oversee all other project team members. GGS has a dedicated project management team within its Operations division. This team manages all aspects of the delivery of all our projects and programs on a global scale. Each program / project has an assigned project manager

responsible for the on-time, in-budget and in-scope delivery. Many members of the Operations team have formerly or currently PMP designations.

Utilities/Program Administrators:

- Provide funding and support for heat pump program.
- Develop marketing materials and assist CAP agencies in implementation.
- Serve as liaisons with critical community organizations.

Action for Boston Community Development (ABCD) / Community Action Agencies:

- Utilize existing relationships with community organizations and LMI customers to help with customer acquisition.
- Responsible for installations of equipment .
- Responsible for overall customer relationship

Interstate Renewable Energy Council:

- Design educational materials to promote project participation.
- Track participation and training of participating contractors.
- Conduct recruitment/ outreach to increase the diversity and size of the project-related workforce
- Host workforce recruitment activities to promote this program, with a focus on MWBE contractors
- Gather community input on project participation. Schedule community meetings to gather feedback for process and project improvement
- Document lessons learned and prepare recommendations to replicate and scale a similar program

Fraunhofer Center:

- Lead Evaluation, Measurement & Verification
- Conduct detailed quantitative analysis to determine if technical approach was successful and net load impact of dispatch strategies for different use cases, foremost for increased loads from heat pumps.
- Synthesize EM&V findings, lessons learned and recommendations, scenario analyses, into a format suitable for the overall project Final Report.

Massachusetts Clean Energy Center:

- Collaborate on workforce training opportunities with IREC and other project partners.

Generac Grid Services:

- Provide the battery, thermostat, and hot water control switch hardware.
- Provide the distributed energy resource management system (DERMS) platform
- Aggregate assets into Virtual Power Plants on DERMS platform
- Develop dispatch algorithms
- Dispatch and support DER operations via Network Operations Center (NOC) in Denver
- Overall administrative and reporting requirements, overall project management

Well-orchestrated coordination between the team partners will be required for successful implementation and execution of the program. A project organization chart and RACI matrix will be used to define roles and responsibilities, reporting and escalation protocols, etc.

Key touchpoints between the team members will include ensuring collection of all necessary data needed for EM&V and to flag field operational issues requiring remediation, and quarterly project team meetings.

A communication plan will be created to specify appropriate project communication and meeting protocols, which will include regular project meetings, anticipated to be at least at a quarterly cadence. Tracking of actionable items with due dates and owners will be core to managing execution. Communication tools such as MS Teams or Slack groups, and document sharing via Box or Sharepoint, will be used to enable access to required project documentation. Project documents, such as the Work Breakdown Structure (WBS), Schedule, Budget, and Requirement Traceability Matrix (RTM) will be used as the foundation for team members to be aligned in regards to project objectives. A procurement plan will identify roles and responsibilities of team members and process flow charts for material and invoicing interactions between team members.

A Requirements Traceability Matrix (RTM) will be created in the project initiation phase to define phase requirements from stakeholder input and project objectives. Requirements workshops will be held to facilitate this discussion. The RTM will define business needs, use cases, functional requirements, and non-functional requirements. The team will track requirements back to the WBS, project objectives, and design/testing requirements. The RTM is an effective tool to track scope details, identify scope creep or drift, and initiate change control protocols.

The project team will develop and maintain a task level project plan in Gantt Chart form, based on the WBS, which will also track back to the Milestone Summary and Go/No Go decision criteria. The project plan will be used to identify required resourcing, task dependencies, and manage critical path tasks. A project baseline will be established and used to measure project performance. An earned value management process will track metrics to assess project progress as it relates to planned cost. The team has utilized a variety of project management tools, selection will be done based on the project and stakeholder needs. The team can adapt to a variety of software packages, but commonly used are Asana, Instagantt, or Smart Sheet.

A resource plan will define staffing and outside resources required for each phase of the program. Required training and tools will be identified as part of the process. This plan will be adjusted as needed based on project performance feedback.

An integrated change control process will be employed, which will analyze the impacts to schedule, budget, scope, resourcing etc. Changes will be documented in a change request form for review and approval by the appropriate project stakeholders.

The project partners will work to ensure that a quality control plan is developed during the planning phase of the project. This is done to ensure that installers are abiding by the program rules, customers have a good experience, and the hardware was installed properly and providing the intended functionality. The quality control plan may include:

- Review of program applications and documentation including installation documentation, serial number checks, etc.
- Costs review of installation charges.
- On-site quality audit at time of install for (On a sampling basis)
- 24/7 digital monitoring of assets via the network operations center
- Sampling of existing installations to ensure they are still running

A project risk management plan will be developed during the project planning to review the project from a technical (including cyber security), schedule, and cost perspective. As part of this process, a qualitative/quantitative risk analysis will be performed and updated as new information is identified. From this analysis a risk register will be created with possible mitigation strategies and responsible parties.

As part of efforts to ensure success on the project, the project team and project approach was formulated to utilize proven commercially available technologies, deployed through established demand side management and energy efficiency programs operated by the partner utilities and in conjunction with the outreach partners. Each utility has its respective team of experienced staff and subject matter experts that will support the program. Taken together, this greatly reduces integration risks.

The battery storage systems and thermostats are provided by Generac. As a result, the team has a good understanding of program implementation requirements and hardware costs, installation requirements and lead times.

In addition to the trade partner training and engagement, an existing network of experienced installers exist. Generac's network operation center and customer support center with direct access to internal Generac resources will provide customer support and digital monitoring of the assets in the field.

TECHNICAL QUALIFICATIONS AND RESOURCES

Generac Power Systems, Inc. (Generac) is a leading energy technology company providing advanced power grid software solutions, backup and prime power systems for home and industrial applications, solar + battery storage solutions, and virtual power plant (VPP) and distributed energy resource management system (DERMS) aggregation and control platforms. Generac recently formed an Energy Technology organization focused on supporting the next-generation grid with a comprehensive energy ecosystem comprised of solar and battery storage systems, energy monitoring, smart devices for intelligent energy management, as well as an extensive portfolio of grid services. Generac offers a wide array of power products suitable as grid-tied distributed energy resources (DER) assets, controllable and dispatchable by way of the Concerto™ VPP/DERMS software platform.

Generac subsidiary Generac Grid Services (GGS) will be acting in a lead capacity for this project.

Interstate Renewable Energy Council (IREC)

For 40 years, IREC has worked toward a 100% clean energy future that is reliable, resilient, and equitable. This vision is realized through industry-leading regulatory reform, initiatives in local communities across the U.S., and programs to develop a diverse, high-performing workforce. IREC has a track record of leading successful projects for DOE, EDA, states, and foundations. In the past 10 years, IREC and The Solar Foundation (TSF) (the two entities merged in July 2021) have successfully managed federal grants totaling over $42 million. Current and pending DOE projects include EMPOWERED, SolSmart, Solar Ready Vets, and Cultivating a New Generation of Diverse Weatherization Assistance Program Workers.

IREC's workforce team has extensive experience in training and credential development, creation of career pathway exploration and outreach resources, facilitation, stakeholder coordination, and program evaluation. IREC has assembled a project team of national and local partners with complementary expertise and networks, including direct access to employers. Since 2010, IREC's Credentialing Program has supported the national network of Weatherization Training Centers to continuously improve the quality of training for the WAP workforce. In 2020, IREC designed and developed 29 job-focused modules for WAP Subgrantee administrative personnel. Within seven months of launch, almost 20,000 courses had been completed by about 3,000 learners IREC has provided an engaging and interactive means to promote clean energy careers through the deployment of career maps. The Green Buildings Career Map highlights 55 energy efficiency careers. IREC is a member of DOE's Better Buildings Workforce Accelerator and convenes the National Clean Energy Workforce Alliance, which unites hundreds of clean energy workforce stakeholders to develop solutions to shared challenges, including lack of workforce diversity. As an American National Standards developer and nationally recognized clean-energy credentialing organization, IREC also brings more than 20 years of credentialing program management expertise to this project.

Massachusetts Electric Utilities and Energy Efficiency Program Administrators

Cape Light Compact

- Cape Light Compact is a nationally recognized award-winning energy services organization operated by the 21 towns on Cape Cod and Martha's Vineyard and Dukes County in Massachusetts.
- The Compact's mission is to serve its 208,000 customers through the delivery of proven energy efficiency programs, effective consumer advocacy and renewable competitive electricity supply.

Unitil

- Unitil Corporation is a public utility holding company with operations in Maine, New Hampshire and Massachusetts.
- Together, Unitil's operating utilities serve approximately 107,700 electric customers and 86,600 natural gas customers.

Eversource

- Eversource Energy is a publicly traded, Fortune 500 energy company headquartered in Hartford, Connecticut, and Boston, Massachusetts, with approximately 4 million customers in Connecticut, Massachusetts, and New Hampshire.
- Eversource has more than 4,270 circuit miles of electric transmission lines, 72,000 pole miles of distribution lines, and 6,459 miles of natural gas pipeline in New England.

National Grid

- National Grid is one of the largest investor-owned energy companies in the US — serving more than 20 million people throughout New York and Massachusetts.
- National Grid operates an electricity distribution network of approximately 116,250 circuit kilometers (72,235 miles) in New England and upstate New York.

Collectively, the electric utilities and the Cape Light Compact serve as the Administrators of the MassSave Energy Efficiency Programs in Massachusetts.

In 2021 alone the MassSave Energy Efficiency Programs:

- Had expenditures of nearly $650 million to run electric energy efficiency programs with over 4.3 million residential participants
    - This included over 25,000 income eligible participants with a budget of over $75 million
- Had expenditures of over $315 million to run gas energy efficiency programs with over 710,000 participants
    - This included nearly 19,000 income eligible participants with a budget of nearly $60 million

Massachusetts has consistently been ranked either number 1 or 2 in the nation in the State Energy Efficiency Scorecard by the American Council for an Energy-Efficient Economy (ACEEE). The energy efficiency programs in Massachusetts are some of the most mature and well-developed programs anywhere in the country. Additionally, the Program Administrators have some of the most aggressive heat pump goals in the country, with a goal to install over 40,000 heat pumps during the 2022-2024 time period The program proposed in this grant application will leverage the existing energy efficiency program delivery mechanisms to help deliver the additional equipment proposed in this application.

Fraunhofer USA, Building Energy Systems

Fraunhofer USA CMI's interdisciplinary Energy Systems Team performs applied R&D on building technologies and distributed energy resources (DERs) to help achieve a sustainable energy future. Fraunhofer specializes in the following areas: Test and evaluate the real-world performance of building energy systems and DERs; Develop building performance assessment and control algorithms; Develop and demonstrate technologies that optimize dispatch of distributed electric generation and loads; Increase the hosting capacity of the utility grid for

renewable generation; Facilitate the deployment of DER Systems at scale; and Assess building technologies to identify high-impact energy savings opportunities.

Massachusetts Clean Energy Center (project collaborator, not official project partner)
The MassCEC is dedicated to the success of clean energy technologies, companies, and projects in Massachusetts, along with creating great jobs and economic growth for the state. Some of their actions include:

- Making direct investments in clean energy companies
- Building a clean energy workforce
- Supporting renewable energy projects in Massachusetts

Action for Boston Community Development (ABCD)
ABCD is a non-profit human services organization that each year provides more than 100,000 low-income residents in the Greater Boston region with the tools and resources needed to transition from poverty to stability and from stability to success.

To fulfill this purpose, ABCD uses a comprehensive approach that systematically addresses the range of barriers faced by households in poverty, from day-to-day crises to long-term needs for jobs and education.

In 2021, ABCD assisted 32,612 households in obtaining LIHEAP benefits, helped 1,310 lower their energy bills with weatherization services and heating system upgrades, and provided 1,587 single family households with appliance audits and product upgrades.

Project Manager and Project Team Experience
The proposed team for this project has decades of project management experience with a specialization in complex software + hardware deployments. The team is focused on delivering distributed energy resource (DER) programs across the country. Many of the team members have obtained Project Management Professional (PMP) certification.

Time Commitment of Key Team Members
See Tab A) Personnel in the Budget Justification Workbook for details regarding the time commitment proposed for this project.

Prior Experience Performing Tasks of Similar Risk and Complexity
The Project Team has extensive experience rolling out programs related to demand resource and virtual power plants. Several case studies are presented below.

Portland General Electric – 2017 to present
Generac Grid Services was selected as the mixed-DER asset real-time control and optimization platform for PGE's DR distributed power plant. This multi-program-multi-vendor-ecosystem allows for the customization across DER asset-types, location, participation schedules and service offerings, while providing visibility into, and integration of, data in an approach that is scalable, sustainable, futureproof, and customer-focused.

PGE's VPP now includes an EVSE daily load shift managed charging program, over 100 commercial and industrial customers, over 400 commercial smart thermostats, and more than 10,000 multi-family smart electric water heaters (including Generac branded water heater switches). The VPP is currently integrating a combination of solar, storage, and smart thermostats at a Fire Station with the City of Portland to demonstrate a turnkey microgrid solution in partnership with Powin Energy. PGE is also rolling out a Time-of-Use (TOU) Program and Peak Time Rebate (PTR) Program that targets 58,000 customers.

Southern California Edison – 2021 to present
Southern California Edison has partnered with GGS to offer SCE residential customers the opportunity to earn incentives, and help their community create a more sustainable and resilient electrical grid. The Power Flex Program is a virtual power plant pilot that allows SCE to use Generac's residential solar PV and battery storage to power homes during times of peak demand on the distribution system. This helps alleviate pressure on the grid and prevent power outages. GGS is responsible for recruiting up to 400 Generac solar PV and battery storage system owners to contribute up to 1 MW to this program.

Generac VPP – ERCOT – 2021 to present
GGS is utilizing distributed energy resources (DERs) to provide emergency capacity to ERCOT through the Emergency Response Service (ERS). GGS has developed an end-to-end solution that includes direct marketing to eligible customers, enrollment management and customer validation, device configuration, event management, incentive fulfillment, and customer support.

Adequate Access to Resources, Facilities, and Equipment
Generac is a Fortune 1000 company listed on the S&P 500 with manufacturing facilities across the country and globe. Generac has over 10,000 employees worldwide with net sales over $4.5 billion in the last twelve months. Generac, along with its partners in this project have the resources necessary to execute on this project. Generac will ensure there is sufficient availability of the hardware necessary to implement this project, namely PWRcell batteries, ecobee thermostats, and hot water load control switches. Additionally, Generac will ensure that the DERMS software necessary for this project is state of the art. IREC has sufficient resources and experience to ensure that workforce development activities will happen at the highest levels and that the areas of the project reap community benefits related to workforce training.

The Cape Light Compact, Unitil, Eversource, and National Grid have existing energy efficiency and demand side management programs. The staff and other resources from these existing programs will be utilized to help implement this project and ensure its success.

Other Attachment File(s)

*** Mandatory Other Attachment Filename:** 1234-TechnicalVolume.pdf

Add Mandatory Other Attachment | Delete Mandatory Other Attachment | View Mandatory Other Attachment

To add more "Other Attachment" attachments, please use the attachment buttons below.

Add Optional Other Attachment | Delete Optional Other Attachment | View Optional Other Attachment

Project/Performance Site Location(s)

Project/Performance Site Primary Location

☐ I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name: Generac Grid Services

UEI:

* Street1: Multiple Locations

Street2:

* City: Multiple Cities Across MA

County:

* State: MA: Massachusetts

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 021111006

* Project/ Performance Site Congressional District: MA-all

Project/Performance Site Location 1

☐ I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name:

UEI:

* Street1:

Street2:

* City:

County:

* State:

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code:

* Project/ Performance Site Congressional District:

Additional Location(s)

Add Attachment | Delete Attachment | View Attachment

OMB Number: 4040-0004
Expiration Date: 11/30/2025

Application for Federal Assistance SF-424

* 1. Type of Submission:
- [ ] Preapplication
- [x] Application
- [ ] Changed/Corrected Application

* 2. Type of Application:
- [x] New
- [ ] Continuation
- [ ] Revision

* If Revision, select appropriate letter(s):

* Other (Specify):

* 3. Date Received: 03/16/2023

4. Applicant Identifier:

5a. Federal Entity Identifier:

5b. Federal Award Identifier:

State Use Only:

6. Date Received by State:

7. State Application Identifier:

8. APPLICANT INFORMATION:

* a. Legal Name: Generac Grid Services

* b. Employer/Taxpayer Identification Number (EIN/TIN): 85-3718323

* c. UEI: LNDSEFA6D6B9

d. Address:

* Street1: 1515 Wynkoop St, Suite 710
Street2:
* City: Denver
County/Parish:
* State: CO: Colorado
Province:
* Country: USA: UNITED STATES
* Zip / Postal Code: 802025560

e. Organizational Unit:

Department Name:

Division Name:

f. Name and contact information of person to be contacted on matters involving this application:

Prefix:
* First Name: Michael
Middle Name:
* Last Name: Goldman
Suffix:

Title:

Organizational Affiliation:

* Telephone Number: 6082133570
Fax Number:

* Email: mgoldman@generacgs.com

Application for Federal Assistance SF-424

*** 9. Type of Applicant 1: Select Applicant Type:**

Q: For-Profit Organization (Other than Small Business)

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

* Other (specify):

*** 10. Name of Federal Agency:**

National Energy Technology Laboratory

11. Catalog of Federal Domestic Assistance Number:

81.254

CFDA Title:

Grid Infrastructure Deployment and Resilience

*** 12. Funding Opportunity Number:**

DE-FOA-0002740

* Title:

BIL Grid Resilience and Innovation Partnerships (GRIP)

13. Competition Identification Number:

Title:

14. Areas Affected by Project (Cities, Counties, States, etc.):

Add Attachment | Delete Attachment | View Attachment

*** 15. Descriptive Title of Applicant's Project:**

Accelerating building thermal electrification while managing system impacts

Attach supporting documents as specified in agency instructions.

Add Attachments | Delete Attachments | View Attachments

Application for Federal Assistance SF-424

16. Congressional Districts Of:

* a. Applicant: CO-001 * b. Program/Project: MA-all

Attach an additional list of Program/Project Congressional Districts if needed.

Add Attachment | Delete Attachment | View Attachment

17. Proposed Project:

* a. Start Date: 01/01/2024 * b. End Date: 12/31/2028

18. Estimated Funding ($):

* a. Federal	49,835,370.00
* b. Applicant	52,939,597.00
* c. State	0.00
* d. Local	0.00
* e. Other	0.00
* f. Program Income	0.00
* g. TOTAL	102,774,967.00

*** 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

☐ a. This application was made available to the State under the Executive Order 12372 Process for review on .

☐ b. Program is subject to E.O. 12372 but has not been selected by the State for review.

☒ c. Program is not covered by E.O. 12372.

*** 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes," provide explanation in attachment.)**

☐ Yes ☒ No

If "Yes", provide explanation and attach

Add Attachment | Delete Attachment | View Attachment

21. *By signing this application, I certify (1) to the statements contained in the list of certifications and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 18, Section 1001)**

☒ ** I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix: * First Name: Michael

Middle Name:

* Last Name: Goldman

Suffix:

* Title: Director, Regulatory Affairs

* Telephone Number: 6082133570 Fax Number:

* Email: mgoldman@generacgs.com

* Signature of Authorized Representative: Michael Goldman * Date Signed: 03/16/2023

BUDGET INFORMATION - Non-Construction Programs

OMB Number: 4040-0006
Expiration Date: 02/28/2025

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. GRIPS Topic 2 - Deployment, Aggregation, and Dispatch of Heat Pumps and Batteries (and other DERs where possible)	81.254 – Grid I	$	$	$ 49,835,370.00	$ 52,939,597.00	$ 102,774,967.00
2.						
3.						
4.						
5. Totals		$	$	$ 49,835,370.00	$ 52,939,597.00	$ 102,774,967.00

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SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY (1)	(2)	(3)	(4)	Total (5)
	GRIPS Topic 2 - Deployment, Aggregation, and Dispatch of Heat Pumps and Batteries (and other DERs where possible)				
a. Personnel	$ 17,548,381.00	$	$	$	$ 17,548,381.00
b. Fringe Benefits					
c. Travel	30,750.00				30,750.00
d. Equipment	79,061,182.00				79,061,182.00
e. Supplies					
f. Contractual	4,218,288.00				4,218,288.00
g. Construction					
h. Other	1,916,366.00				1,916,366.00
i. Total Direct Charges (sum of 6a-6h)	102,774,967.00				$ 102,774,967.00
j. Indirect Charges					$
k. TOTALS (sum of 6i and 6j)	$ 102,774,967.00	$	$	$	$ 102,774,967.00
7. Program Income	$	$	$	$	$

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SECTION C - NON-FEDERAL RESOURCES

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e)TOTALS
8. GRIPS Topic 2 - Deployment, Aggregation, and Dispatch of Heat Pumps and Batteries (and other DERs where possible)	$ 52,939,597.00	$	$	$ 52,939,597.00
9.				
10.				
11.				
12. TOTAL (sum of lines 8-11)	$ 52,939,597.00	$	$	$ 52,939,597.00

SECTION D - FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$ 1,779,498.00	$ 889,749.00	$ 296,583.00	$ 296,583.00	$ 296,583.00
14. Non-Federal	$ 952,440.00	476,220.00	158,740.00	158,740.00	158,740.00
15. TOTAL (sum of lines 13 and 14)	$ 2,731,938.00	$ 1,365,969.00	$ 455,323.00	$ 455,323.00	$ 455,323.00

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Program	FUTURE FUNDING PERIODS (YEARS) (b)First	(c) Second	(d) Third	(e) Fourth
16. GRIPS Topic 2 - Deployment, Aggregation, and Dispatch of Heat Pumps and Batteries (and other DERs where possible)	$ 6,830,161.00	$ 12,419,641.00	$ 14,032,272.00	$ 14,773,799.00
17.				
18.				
19.				
20. TOTAL (sum of lines 16 - 19)	$ 6,830,161.00	$ 12,419,641.00	$ 14,032,272.00	$ 14,773,799.00

SECTION F - OTHER BUDGET INFORMATION

21. Direct Charges:

22. Indirect Charges:

23. Remarks:

PROJECT DESCRIPTION AND ASSURANCES DOCUMENT (PDAD)

Project title: Accelerating Building Thermal Electrification while Managing System Impacts

Applicant Name: Generac Grid Services

Applicant Address: 1515 Wynkoop St, Suite 710, Denver, CO 80202

Names of all team member organizations (if applicable): Generac Grid Services, Interstate Renewable Energy Council, Fraunhofer Center, Cape Light Compact, Unitil, Eversource Energy, National Grid, Action for Boston Community Development

Principal Investigator (Name, Address if different than Applicant's, Phone Number, E-mail):

Gavin Hume, ghume@generacgs.com, (604) 998-8902

Business Point of Contact (Name, Address if different than Applicant's, Phone Number, E-mail):

Anne Hoskins, anne.hoskins@generac.com, (414) 363-0475

Include any statements regarding confidentiality. Please treat the Innovations and Impacts section in the Technical Volume and all budgets as confidential. The rest of the application does not contain any confidential information.

Federal Share: $49,835,370

Cost Share: 51.51%

Total Estimated Project Cost: $102,774,967

Item 1: Specify (mark with "X")" the FOA Topic Area and as applicable the Area of Interest (AOI):

_____Topic Area 1: **Grid Resilience Grants** (BIL section 40101(c))

__X__Topic Area 2: **Smart Grid Grants** (BIL section 40107)

_____Topic Area 3: **Grid Innovation Program** (BIL section 40103(b)) – Area of Interest 1 (**Transmission** System Applications)

_____Topic Area 3: **Grid Innovation Program** (BIL section 40103(b)) – Area of Interest 2 (**Distribution** System Applications)

_____Topic Area 3: **Grid Innovation Program** (BIL section 40103(b)) – Area of Interest 3 (**Combination** System Applications)

TOPIC AREA 1 Specific Items:

Item 2: Specify (mark with "X")" the entity type of the applicant organization:

_____electric grid operator

_____electricity storage operator

_____electricity generator

_____transmission owner or operator

_____distribution provider

_____fuel supplier

If further description is needed for the specified entity type, please provide below:

Item 3: Please provide the total amount (USD) of qualifying resilience investments (as outlined in DE-FOA-00002740) that has been spent for the previous 3 years. Please also provide the time period utilized for calculation of this amount.

Total Amount:
Time Period for Resilience Investments:

Note: Topic Area 1 applicants must submit as part of their application, a report detailing past, current, and future efforts by the eligible entity to reduce the likelihood and consequences of disruptive events. This report should include efforts over at least the previous 3 years and at least the next 3 years and any broader resilience strategy used by the applicant.

Item 4: Is the eligible entity a Small Utility as defined in DE-FOA-0002740 (sells no more than 4,000,000 MWh of electricity per year)? If NO is selected, skip to Item 7.

_____Yes

_____No

Note: If YES, applicant must provide their Form 861 for the last reporting year submitted to the Energy Information Administration (EIA).

Item 5: Per BIL section 40101(e)(2) (C) APPLICATION LIMITATIONS.—An eligible entity may not submit an application for a grant provided by the Secretary under subsection (c) and a grant provided by a State or Indian Tribe pursuant to subsection (d) during the same application cycle.

Therefore, is the eligible entity a Subaward/Subcontract recipient for an application submitted under IIJA Section 40101(d), ALRD 2736? If "YES", please describe the differences between the GRIP FOA 2740 application [40101(c)] and the ALRD 2736 [40101(d)] applications in the box below:

_____Yes

_____No

TOPIC AREA 2 Specific

No items

TOPIC AREA 3 Specific

Item 6: Specify (mark with "X")" the entity type of the applicant organization:

_____a State

_____a combination of 2 or more States

_____an Indian Tribe

_____a unit of local government

_____a public utility commission

If further description is needed for the specified entity type, please provide below:

Item 7:

Authorized Organizational Representative (AOR): please provide name, address, phone number and e-mail address for the authorized agent to bind the entity

Authorized Organizational Representative (AOR):

Name: Michael Goldman

Address: 1515 Wynkoop St, Suite 710, Denver, CO 80202

Phone: 608-213-3570

E-mail: mgoldman@generacgs.com

Item 8: Signature of Authorized Organizational Representative (AOR)

GENERAC | GRID SERVICES

Michael Goldman

Director, Business Development and Regulatory Affairs
mgoldmn@generacgs.com
Mobile: +1 608-213-3570

Michael has spent over 15 years across various roles within the energy industry. He's currently a Director, Business Development and Regulatory Affairs at Generac Grid Services (GGS) where he identifies macroeconomic and regulatory trends in the energy industry and translates them into actionable business insights for senior executives. He is also responsible for developing GGS' electric vehicle strategy and oversees the light duty EV managed charging program deployment. Michael regularly speaks about his work and contributes to industry publications. Prior to his current role, he spent nearly ten years at Eversource Energy, the largest utility in New England, where he led the regulatory and strategic direction of the company's behind-the-meter peak load reduction programs.

Experience

Generac Grid Services
Director, Business Development and Regulatory Affairs — 2021 - Present

- Identify macroeconomic and regulatory trends in the energy industry; translate those trends into actionable insights to capitalize on business opportunities
- Advise senior executives on industry developments that could be material to business outcomes, especially related to distributed energy resources (DER), demand response (DR), virtual power plants (VPP), electric vehicles (EV), and distributed energy resource management systems (DERMS)
- Develop electric vehicle (EV) strategy and oversee light duty EV managed charging program deployment
- Evaluate and recommend industry partners for possible commercial relationship, focusing on new technologies that capitalize on regulatory and public policy trends
- Monitor state and federal legislation, and public utility commission proceedings for opportunities and risks related to distributed energy
- Review potential acquisition targets, participate in acquisition due diligence review committee
- Participate in industry working groups, present extensively at conferences, publish in industry publications
- Member of corporate Public Policy Committee

Eversource Energy
Director — 2012-2021

- Lead strategic/regulatory efforts around customer sited, behind the meter distributed energy resources
- Lead 30+ person team, spread across three states, responsible for all regulatory, planning, evaluation and support services for $700+ million energy efficiency and demand response portfolio
- Evaluate distributed energy resource technologies through in the field demonstration projects including battery/thermal storage technologies, demand response, and automated load control
- Communicate use cases and value proposition of new distributed energy resource technologies to relevant stakeholders and customers
- Develop strategy to reduce system peak demand through behind the meter technologies
- Review opportunities and challenges associated with electric vehicle (EV) grid integration
- Plan EV load management and charger deployment strategies, evaluate future

opportunities
- Perform net present value analysis of EE and distributed energy resources investments, analyzing the cash flows from the avoided costs of multiple commodities for $500 million portfolio
- Provide expert witness testimony at multiple state utility commissions (MA, NH, CT)
- Liaise with and develop consensus among diverse internal/external stakeholders to achieve objectives
- Set strategic direction for company's energy efficiency participation in ISO-NE's Forward Capacity Market
- Advise leadership on the integration of distributed energy resources into T&D planning and load forecasting with emphasis on geo-targeting
- Oversee procurement process for contracts valued in the millions of dollars
- Analyze state and federal legislation for business risks and opportunities
- Participate as a member of the company's Utility of the Future – Integrated Grid initiative and as a member of the company's Renewable/Carbon Goal Impact Analysis team

Deloitte Consulting
Consultant 2010-2012
Energy & Resources Practice Area
Strategy and Operations
- Advise senior leadership on domestic and foreign government energy policies
- Perform economic analysis on the O&M consequences of energy usage in large government facilities
- Present trends in natural gas production and consumption to senior leadership
- Develop cost mitigation strategies for electricity generation units and transmission & distribution systems
- Research and develop learning materials for unconventional fossil fuel sources
- Recommend risk mitigation strategies for energy consumption and GHG emissions
- Assist on the development of bids for new work and RFP responses

PowerAdvocate
Energy Business Analyst 2008-2010
- Advise clients on market and pricing opportunities in the power industry
- Manage client projects and liaise with key client stakeholders
- Forecast commodity and technology prices critical to power sector
- Model power generation facility costs employing a bottom up approach
- Provide expert analysis on environmental regulatory policies and emission issues
- Generate financial statements and pro formas for internal company use

Education

Universoty of Wisconsin-Madison 2004
Bachelor of Arts, Electrical Engineering

Johns Hopkins University 2008
Master of Art, International Finance and Energy Policy

GENERAC | GRID SERVICES

Gavin Hume

Vice President, Operations
ghume@generacgs.com
Office: +1 604-998-8902

Gavin has over 25 years of experience in implementing innovative energy management projects, and interfacing between distributed energy resource owners, vendors and system operators. Within his 17 years at Generac Grid Services, Gavin has led the global operations teams and worked directly with utility customers in North America, Europe, Middle East and Australia. This experience includes PGE, AGL Energy, Eversource and RWE, where Gavin provides subject matter expertise for the development of new programs, DER vendor selection, integration design, risk assessments, and guidance on project/program evaluation and KPIs. Gavin was also instrumental in the implementation of Generac Grid Services first-of-its kind load-based Regulation Service offering in the PJM and IESO wholesale electric markets. Gavin's knowledge of mechanical, electrical and control systems, energy management, process development, customer service and project management has enabled collaborative and effective DER vendor integrations with companies such as ecobee and ChargePoint.

Experience

Generac Grid Services

Vice President, Operations — 2016 – Present

- Responsible for global project delivery and contract execution for software and services business
- Leads Global Project Delivery team
- Management responsibility for seven core functions: Project management, Controls Engineering, Systems Engineering, Customer Support, Inside Sales, Network Operations and Program delivery
- Responsible for revenue forecasting for contracted projects

Vice President, Utility Solutions — 2013 – 2015

- Management responsibilities for Sales Operations, Engineering and Network Operations Center
- Sales Operations team lead providing technical sales support
- Network Operations Center lead
- Project Management

Vice President, Network Operations — 2006 – 2013

- Instrumental in the implementation of Generacs' first-of-its kind load-based Regulation Service offering in the PJM and IESO wholesale electric markets
- Implementation lead for Hybrid Heating (fuel switching) projects involving commercial HVAC installations with electrical and mechanical contractors
- Ongoing monitoring and optimization on Hybrid Heating systems

ESC Automation

Sales/Project Manager — 2003 – 2006

- Overall responsibility for the sales, implementation and execution of commercial building automation installations for a remote office
- Managed a team of 3 Applications Engineers and 5 Field Electricians to execute commercial HVAC automation projects including recruitment, retention and performance management
- Proposal creation, estimation and presentation for new projects
- Lead customer management and issue resolution
- Provided design and technical support for Application Engineers with more difficult technical problems and service support

Project Manager — 2000 – 2003

- Overall responsibility for the implementation and execution of commercial building automation installations
- Project revenue and cost forecasting
- Managed a team of 3 Applications Engineers and 5 Field Electricians to execute commercial HVAC automation projects including recruitment, retention and performance management

Senior Application Engineer/Technical Support — 1998 - 2000

- Commercial HVAC automation system design
- Managed customer communication on project status
- Field installation coordination with electrical teams
- Automation systems programming and commissioning
- As built engineering documentation and commissioning reports

Education

Royal Roads University — 2002
Bachelor of Business Administration, Entrepreneurial Mgmt.

BC Institute of Technology — 1998
Electronics Technologist Diploma,
Instrumentation and Process Automation

Licenses & Certification

Project Management Professional (PMP) — 2019
Certified Energy Manager — 2014
NYISO Market Orientation Course — 2010
US Green Building Council, LEED AP — 2008

GENERAC | GRID SERVICES

Eric Young

Vice President, Industry Solutions
eyoung@generacgs.com
Mobile: +1 914-656-1256

Eric is an accomplished executive with expertise in making sense of the digital disruption for asset intensive companies and industries. His ardency for assisting organizations move to next generation digital technologies, analytics and services, enables a new and improved consumer experience. Eric has developed new concepts to target specific business challenges in the areas of predictive asset management, demand side management, reactive power management and grid-scale energy optimization. Eric's experience comes from major energy generation and distribution enterprises looking to transform their operations, government authorities driving energy sector reforms, as well as building new businesses and new teams. This background makes him a key pillar in understanding requirements, architecting, and deploying large scale network solutions, where risk management, reliability, and security are key to delivering innovative automation in the energy industry.

Eric has direct experience with large and mid-size enterprises in the US, Western and Eastern Europe, Russia, Turkey and South Africa.

Experience

Generac Grid Services
Vice President, Industry Solutions — 2016 - Present

- Manages Commercial Operations and Solutions teams
- Member of Executive Leadership Team, involved in the decision-making process for Proposals, including Go/ No-Go, response crafting, and final review before submission
- Utilizes decades of experience in networking and systems integration towards solution design. Responsible for reviewing requirements, architecting, and deploying large scale network solutions. Focusing on risk management, reliability, and security.

ABS Group
Director, Power Sector Asset Management — 2014 - 2015

- Building asset performance optimization business for the Power Industry, including Renewable integration, Generation, Transmission and Distribution.
- Generate revenue growth from the improvement of client's operating margins by embracing the explosion of data from IoT and connected sensors.

IBM
Utilities Industry Services Leader, North America — 2013 - 2014

- Entrusted with transforming IBM's approach to Strategic Outsourcing for current and prospective Utility clients with a focus on business outcomes and the optimization across business processes.

Energy & Utilities Sales Director, Central & Eastern Europe — 2011 - 2013

- Transformed the Utility-focused sales strategy across the 30 countries in Central & Eastern Europe, while based in Prague, Czech Republic in order to develop long term, high value business opportunities beyond single transaction sales.
- Introduced IBM's knowledge-based services and solutions to both clients and local country leaders, sales and delivery teams. Qualified key industry-led opportunities and drove all aspects of opportunity management, consultative business value methodology, cross brand coordination, execution, and industry & business process expertise to generate organic growth.

Energy & Utilities Global Business Development Executive — 2008 - 2013

- Drove all aspects of opportunity validation and management, consultative business value methodology, cross brand coordination, execution and industry and business process expertise to generate organic growth.
- Developed and refined intellectual property in the areas of Distribution Automation, Energy Conservation, Distributed Energy Resources including Renewables, and Utility Business Process Optimization.

Engineering Services Manager, Energy & Utilities, Chemical & Petroleum, Distribution — 2006 - 2008

- Established an internal startup to develop and deliver custom hardware and engineering services and grew it to $12M revenue in the first year, by providing industry expertise within the Engineering Services business unit.
- Managed all facets of engineering services portfolio, including client engagement and needs assessment, value proposition development, offerings, business development, post sales delivery, and contract management.

Manager & Technical Advisor to the VP of Microprocessor Technology Development — 2004 - 2006

- Selected for two-year high profile leadership assignment, which facilitated development of expertise in managing profit and loss, refinement of corporate level decision making skills and the successful accomplishment of corporate milestones.
- Served as Technical Advisor supporting VP of Product Technology Development by managing schedule and function for 50 projects, establishing organizational milestones and metrics, leading critical task forces, driving initiatives for C-suite leadership team and top clients such as Apple, Cisco and Sony.
- Assisted VP in managing 1,800 employees globally.

Manager & Engineer, CISC/RISC Microprocessor Design — 1997 - 2005

- Managed a team of engineers from New York, Texas and Germany to deliver on time and within budget by developing innovative microprocessor designs and project management plans for Power and Mainframe servers.
- Directed project design, analysis, experimentation, and documentation to drive delivery of new complex systems, products, processes, and methods.

LTV Steel
Project Engineer, Controls — 1995 - 1996

- Drove key digital automation projects, including IT/OT convergence of analog control systems and quality sensors via software systems and enabled by a new fiber optic intranet.
- Led electrical facility and equipment upgrades, computer/IT installation and maintenance, and SCADA production automation equipment installation.

Education

University of Pittsburgh — 1996
Bachelor of Science, Electrical Engineering, VLSI and Control Systems

Licenses & Certifications

Lutron Certified Automation Professional, Lutron Electronics. — 2021

GENERAC | GRID SERVICES

Darren Wong

Director of Operations
dwong@generacgs.com
Mobile: +1 604-998-8909

Darren Wong has been an integral member of the Generac Grid Services team since he first joined the company after graduating college in 2003. His early years with the customer were spent in analyst positions: technical, project and engineering. In 2009, Darren was promoted to manager of Analytic and Data Services, a position in which he used his strong knowledge of computing to help Generac Grid Services fine-tune the optimization engines within the company's software platform that supports grid balance through demand management.

Today, Darren is the director of operations, which puts him center stage in project delivery, enabling customer sites, distributed energy resources and aggregators to provide demand flexibility and participate in energy markets. His project management and utility program experience, combined with his proficiency of industrial and building processes allows him to maximize benefits for customers such as Public Service of New Mexico, Eversource Energy, PJM and IESO, and collaborate effectively with Generac Grid Services' partners at C Power, EnelX, Voltus, EnergyHub, Centrica, Direct Energy, Tesla, Stem and Pelican Wireless Solutions.

Experience

Generac Grid Services

Director of Operations — 2019 - Present

- Manage international projects and programs
- Collaborate with the leadership team on strategic initiatives from idea generation to solution deployment
- Established and oversee GGS NOC operations
- Lead and manage the platform support team

Manager, Client Activation Services — 2013 - 2019

- Project management of larger GGS accounts
- Supervised cross-functional team to design and deploy solutions against contracted specifications
- Develop and implement control strategies to allows sites to participate in regulation and power shift markets
- Act as a subject matter expert to other departments to support development of new technologies and strategies
- Provide governance and approval on user acceptance testing of our software platform

Manager, Analytical & Data Services — 2009 - 2013

- Designed, implemented and managed data organization and structure on servers
- Developed and operated new tools for simulation and modelling (Python, C++)
- Managed customer reporting and invoicing
- Designed and executed site acceptance test plans to integrate new sites into the Generac platform
- Created training material and SOPs; trained new staff in operations of the Generac platform and its subsystems

Senior Engineering Analyst — 2007 - 2009

- Developed new site analysis tools and models to improve efficiency
- Performed site analysis to assess potential projects
- Managed development of web-based (Ruby) reporting system tool
- Design and implementation of reporting and invoicing system to meet new company requirements

Project Analyst — 2005 - 2007

- Performed site analysis to assess potential hybrid heating projects; identified control strategies and value streams available to customers

- Designed and managed 3rd party development of new MS Access billing and reporting systems
- Managed generation of customer invoices and reports
- Trained new hires

Technical Analyst — 2003 - 2005

- Created and maintained data analysis models (building electric vs. gas/propane)
- Created and maintained reporting, and billing spreadsheets
- Performed data analysis and prepared reports which were used to directly drive business cases
- Generated customer invoices
- Programmed and monitored site PLC's

Education

Simon Fraser University — 2019
MBA in Management of Technology

The University of British Columbia — 2003
Bachelor of Applied Science, Computer Engineering

Certification

Professional Engineer, Engineers and Geoscientists BC

Languages

English, Cantonese and Mandarin

GENERAC | GRID SERVICES

Kristi Jo “KJ” Kezar

Manager of Sales Solutions
kkezar@generacgs.com
Mobile: 304-299-1953

KJ has over two decades of experience in energy program design, program launch and management, solution and strategy design, sales support, product marketing. Her other areas of expertise include field and program marketing, program outreach, energy engineering, evaluation, measurement and verification, and commercial building commissioning. She has managed program design, implementation, and management services to clients across the U.S., including Wisconsin’s Focus on Energy; FirstEnergy Pennsylvania, Ohio, Maryland, and West Virginia; the Energy Trust of Oregon; Hawaii Public Utility Commission; Energize Delaware; and Ameren Illinois Utilities.

Experience

Generac Grid Services LLC

Manager of Sales Solutions — 2022 - Present

- Leads Commercial Operations team
- Manages proposal response process from identification of opportunity, assignment of proposal manager, to final submission
- Manages planning and execution of response for Best and Finals
- Leads development of demand side management service offerings in response to market trends and specific customer requests.

Industry Solution Architect — 2021 - 2022

- Responsible for the design, delivery, and management of balanced, easy-to-understand DR and iDSM programs serving both residential and C&I markets.
- Brings together solutions with input from Marketing, Sales, Operations, Finance, etc.

Honeywell

Solution Advisor — 2015 - 2021

- Developed new solutions including Data-driven custom approach for non-residential customers, residential approach for beneficial electrification, prescriptive approach to retro commissioning in commercial facilities
- Led the product marketing development for Command Central Tracking and Reporting System including internal stakeholder and voice of customer requirements collection, leadership approval, vendor screening and proposal review, sales plan development.
- Measure set development with TRM-compliant calculations, estimated installation and participation volumes, load shape development, and regulatory support.
- Subject matter expert on Demand Side Management (DSM) market trends and analysis
- Key contributor to Annual Operation Plan development and budgeting

Leidos Engineering (formerly SAIC,Benham Companies)

EE/DSM Program Design Manager — 2011 - 2015

- Coordination of cross functional personnel in parallel tasking to achieve complex program launches. Coordinate with client staff to capture requirements like brand standards and style guidelines, customer engagement directives, review/approval processes, financial/invoicing set-up
- Direction of set-up for all program infrastructure elements including IT systems, market communication channels (phone, fax, mail, email, website, etc.)
- Coordination with all partner organizations on Scope of Work, communication protocols, and required documentation both internal and client facing
- Created short-format sales training for onboarding of 12 new sales professionals using online tools and training approaches to accommodate various schedules and knowledge gaps. Also wrote detailed sales training materials as an accompaniment.

- Revitalization of program application and instructional materials for existing program portfolio
- Development of program collateral as part of launch and throughout the program cycle, including promotional brochures, case studies, website content, postcards, e-mail communication templates and mass e-mail messaging

Senior Energy Engineer 2008 - 2011

Commercial Building Commissioning (New Construction)

- Planning and execution of on-site functional testing
- Trend data planning, collection, and analysis
- Facility staff training and education
- Interaction with controls vendors and technicians
- Field validation of “as built” engineering and architectural drawings to confirm proper installation and operation of energy efficiency measures.

ITT/Goulds Pumps

Product Specialist 2007 – 2008

- Supported the global sales force in the quoting and installation of small double suction and multistage pumps.
- Provided pricing for non-standard items, constructions, and options within the product lines supported and estimated lead times for product lines supported.
- Offered technical guidance for appropriate application of pumps, mechanical seals, and related products based on customer specifications.
- Supplied necessary technical documentation, such as product literature and pump curves, to support sales and/or end users.
- Interfaced with vendors to procure quotations for non-standard products.

Science Applications International Corp (SAIC)

Energy Engineer 2000 - 2007

- Building Energy Simulation Modeling (126 DOE2/eQuest/Energy+ models)
- Individual Measure Analyses for Commercial Building and Industrial process measures, development of spreadsheet models of varying complexity to determine hourly, annual and lifetime energy savings and demand reduction
- Water/Wastewater Treatment Facility and Process energy efficiency surveys, co-development of audit reports and facility management action plans to guide implementation of recommended measures. Content included energy and demand savings estimate calculations, financial and timeline estimates for implementation of recommended measures.
- Technical outreach and education for water/wastewater industry “circuit riders” to develop knowledge of and skills to identify energy efficiency measures in treatment processes (WI Focus on Energy Industrial Program)

Education

Kettering University 2010

Master of Business Administration

Rose-Hulman Institute of Technology 2000

Bachelor of Science, Chemical Engineering

Professional Licenses & Certifications

Leadership in Energy and Environmental Design (LEED®) Accredited Professional (AP), U.S. Green Building Council

GENERAC | GRID SERVICES

Geoff Gaida, P.E.

Senior Program Manager
ggaida@generacgs.com
Mobile: +1 802-598-6554

Geoff is a professional engineer with over 20 years of experience in the energy industry. Geoff is currently a Senior Program Manager at Generac Grid Services (GGS), where he leads the implementation of GGS DERMS software, and the design of utility electric vehicle monitoring programs. Prior to GGS, Geoff has worked in a variety of technologies including utility scale and behind the meter battery energy storage system, C&I Building Controls and HVAC design, capital efficiency upgrades and PEM fuel cells.

Experience

Generac Grid Services
Senior Program Manager — 2022 - Present

- Program Manager responsible for managing the implementation of utility Distributed Energy Management System (DERMS).
  - Responsibilities include managing a team of internal engineering and sub-contractor resources to achieve specified scope
  - Maintaining a project schedule and budget, and acting as point of contact with the customer.
  - Utilizing technical experience in the energy industry to navigate the complexity and technical aspects of this “First of its kind” deployment at a utility level scale.

Doosan GridTech
Engineering Project Manager — 2021 - 2022

- Project manager leading EPC, O+M and software controls integration projects of utility scale building energy storage systems.
  - Responsibilities include maintaining a project schedule and budget, contract review and negotiation,sub-contractor management, internal reporting, and acting as point of contact with the customer.
  - Responsible for driving the completion and commissioning of the controls and software integration of a 100 MW battery energy storage system within the ERCOT market. Rapidly developed a level of understanding of Doosan’s proprietary software controls.
  - Utilized technical background to step in to fill staffing resource gaps, both technical and commercial in nature, to drive projects to completion.

Iconergy, Ltd
Technical Project Manager — 2014 – 2021

- Project manager and lead engineer for energy related services which included building commissioning services, capital energy efficiency upgrades and renewable and battery energy storage projects for commercial and distributed generation applications.
- Assist clients in identifying and implementing capital upgrades to facilities and manufacturing processes, with a focus on increasing energy efficiency, and PV solar and energy storage opportunities.
- Responsible for all technical and commercial aspects of project execution including internal resources and reporting, as well as managing consultants and subcontractors.
- Responsible for developing company calculation modeling tools, methodologies and standards for utility energy and rates analysis, efficiency savings, renewables assessments, and financial and lifecycle cost modeling.
- Owner’s commissioning agent for new building construction. Scope includes:
  - Detailed review of design documents. Review of contractor documentation: Equipment submittals, RFIs, O+M manuals, as-built design sets.
  - Lead comprehensive functional point-to-point, sequence and safety testing of systems including the troubleshooting of issues.

- Commissioned systems include HVAC, PLC controls, commercial rooftop PV and battery energy storage systems, electrical distribution and manufacturing processes and equipment such as workflows, industrial controls, and compressed air.

- Company lead on solar PV and battery energy storage projects.
  - Perform assessments of commercial PV for owner operated and PPA scenarios. Analysis considers aspects of the facility structure, electrical distribution equipment, utility interconnect requirements, utility rates, financing options, maintenance and de-commissioning, tax benefits and utility or local incentives.
  - Utility consultant and commissioning agent on a 90 kWh behind the meter energy storage + PV demonstration project for a municipal utility facility. System is used for building load shifting, peak shaving and renewable support. System is integrated into a smart grid software to be used as a deployable energy asset.

Eaton Energy Solutions
Project Manager 2011-2014
- Project manager and technical lead on energy projects for biotechnology, healthcare, educational and commercial facilities.
  - Projects focused on optimization of manufacturing processes and building systems including HVAC, controls, and electrical systems.
  - Led projects from design to commissioning, including attending bid-walks, and developing proposals, identifying efficiency upgrades, data analysis, implementation assistance, and functional testing of equipment.
  - Work included capital upgrades, commissioning, retro-commissioning, energy modeling and auditing services.

UTC Power (United Technologies)
Project Engineer 2007-2010
- Acted as lead on a series of design and verification efforts on fuel cells for use in transportation and distributed generation applications.
- Responsible for directing teams of engineers to established technical milestones. Created and tracked resource schedules and budgets. Familiar with military and government project requirements and regulations.
- Technical responsibilities included: vendor selection, material testing/qualification, process development and verification and validation of a finalized design.

Northern Power Systems
Project Manager 2002-2007
- Oversaw several contracts for remote power systems on British Petroleum's AGT Pipelines Project with an aggregate contract value of over $9 Million.
- Created and maintained project budget, cashflow and schedule while managing personnel and resources. Interfaced with client and executed contract change orders.
- Oversaw design, procurement and production along with managing subcontractors.
- Challenges specific to these contracts were negotiating with vendors, managing offsite production, configuration management and extensive customer specifications.

Experience

University of Vermont, BS Mechanical Engineering 1999

Professional Licenses & Certifications

Building Energy Modeling Professional, ASHRAE 2014
Professional Engineer, State of Colorado 2013
Technical Advisor, Building Perormance Standards Task Force, Colorado Energy Office 2021

James Patrick Collins IV

jpcollins4@gmail.com | 617-943-2293 | linkedin.com/in/JamesPCollinsIV | Belmont, MA

EXPERIENCED ENERGY & BUSNIESS LEADER

Over a decade of engaging with key partners and internal and external stakeholders at all levels. Demonstrated ability to plan and manage multiple projects at a time and achieve goals. ***Core competencies include:***

Policy • Strategy & Implementation • Stakeholder Engagement • Relationship Management
Team Building and Leadership • Public Speaking
Operations Management • Budget Planning & Management •Strategic Business Planning
Process Design • Measurement & Evaluation • Marketing • Communications

PROFESSIONAL EXPERIENCE:

ACTION FOR BOSTON COMMUNITY DEVELOPMENT, INC. (ABCD) Boston, MA

ABCD is the largest nonprofit human services agency in New England, with revenues of ~$199M in 2019

Director, Climate Equity & Impact (CE&I) Department (February 2022- Present), Director, Utility Programs (November 2020-February 2022), Program Director, Statewide Energy Program (February 2018-November 2020, Manager, LEAN Low Income Multifamily Energy Retrofit Program (April 2014-February 2018), Coordinator (September 2011- March 2014), Intake Coordinator (July 2010-August 2011), Program Assistant March 2010-June 2010)

- Lead as Department Head, including staff of 25, and an annual budget of over $100M
- Responsible for managing relationship with utility Program Administrator (funding sources)
- Ensure all key performance indicators (KPIs) are met year after year.
- Communicate with external stakeholders, including utility company representatives, representatives from DOER, DHCD, CEC, cities/towns, quasi-state housing finance agencies, legislators, building owners, and housing authority directors. Engage in stakeholder groups and attend meetings and events with civic leaders and elected officials. Present program information in various internal and external settings including association meetings, conferences, working groups and workshops.
- Develop and deploy short and long-term strategies for ABCD CE&I Department and with sub-grantees deploying single family program; lead implementation of new initiatives through statewide network.
- Ensure successful network performance and reach key milestones set every three years by the Massachusetts Department of Public Utilities by monitoring sub-grantee progress toward achieving annual budget and savings goals; adjust resources as needed to meet these goals.
- Contribute to writing grant proposals/RFP responses; implement grant awards and comply with reporting requirements.
- Oversee energy efficiency retrofit program implementation for the Income Eligible sector of MassSave in single and multifamily properties in the Low-Income Energy Affordability Network (LEAN), including the Low Income Multifamily Energy Retrofit Program (LIMF) and 1-4 Residential Program.
- Direct LIMF program process including staffing, marketing, eligibility qualification, project and vendor/contractor selection, price procurement, feasibility studies/cost effectiveness analysis, project field management and installation, inspections/quality control, payment, reporting and evaluation. Manage statewide application intake center for all utilities.
- Supervise diverse team, including administrative staff, technical staff, and consultants. Interview, hire and evaluate all staff. Project staffing needs. Develop staff capabilities through active coaching.
- Engage with architects, engineers and contractors on construction scope development and design.
- Work internally across departments including: Human Resources for hiring/evaluations, Accounting for program expenses/payments, IT for web development, and Communications/Events for marketing/events.
- Develop and manage program budgets and reporting

EDUCATION:

BOSTON COLLEGE CARROLL SCHOOL OF MANAGEMENT Chestnut Hill, MA
Master of Business Administration (MBA) December 2017

BRANDEIS UNIVERSITY Waltham, MA
Bachelor of Arts September 2005-May 2009
American Studies (Major), Environmental Studies (Minor)

COMMUNITY AND LEADERSHIP:

MA ENERGY EFFICIENCY ADVISORY COUNCIL
Equity Working Group Member June 2020-Present

- Member of working group that reviews and recommends changes to all issues around equity and access to energy efficiency programs in Massachusetts.

BRANDEIS UNIVERSITY Community Leadership & Impact Fellowship Waltham, MA
Co-Founder & Selection Committee Member September 2017-Present

- Mini-grant program that aims to expand Brandeis student's engagement with and service to the greater Waltham-Boston area and to strengthen student's leadership capacity.

CITY OF BOSTON MUNICIPAL AGGREGATION WORKING GROUP December 2018-February 2021

- Member of The City of Boston's working group responsible for developing goals and implementation design for Boston's plan to become a Municipal Aggregator.

ACEEE LOW INCOME WORKING GROUP
Member August 2016-Present

- Member of working group for utilities & other program administrators across the country interested in developing new low-income energy efficiency programs and/or improving/expanding existing programs.

SOUTH BOSTON COLLEGIATE LITTLE LEAGUE CLINIC Boston, MA
Co-founder June 2010-2015

- Founded annual free little league clinic for local South Boston youth reaching over 100 children per year.

BOSTON AREA RAPE CRISIS CENTER Cambridge, MA
2017 Walk for Change event volunteer, Annual Gala Volunteer 2017

SKILLS

Google Analytics, WordPress, Microsoft Office Programs (Access, Excel, Word, PowerPoint), CRM Programs (SalesForce, ZOHO CRM), eAssist, VisionDSM, InDemand, R (statistical analytics), Tableau, Team Management Software (Monday.com)

BRIAN J. BEOTE • 4 Wellesley Rd. Beverly, MA 01915 • 978-879-9896 • bbeote@gmail.com

SUMMARY

Energy conservation and building construction professional with 25 years of experience, 12.5 at Action Inc. Excellent communication skills, experienced in liaising with contractors, building owners, utilities, municipalities, and in-house program and executive staff, delivering high-quality energy conservation services.

CERTIFICATIONS

HERS Rater, 2015 • Lead RRP, 2011 • OSHA 10, 2011 • MA/DOE Certified Energy Auditor, 2010
Building Performance Institute Building Analyst, 2010 • MA Construction Supervisors License Unrestricted, 2009

WORK EXPERIENCE

ACTION, INC. ENERGY SERVICES, Gloucester, MA • ***Director, Energy Efficiency Operations, 2016 – Present***

- Supervision and management of the multifamily program and all multifamily staff as well as the Utility Programs Monitor.
- Directly oversee and manage utility budgets for the program and coordinate budgets, expenditures, and projects with sub-grantee partners. Interact daily with National Grid regarding program implementation.
- Actively participate in policy and program design and implementation on the statewide level. Commonly interact with DHCD, DOER, EEAC, MA AGO, MA CEC, and other agencies and organizations.

ACTION, INC. ENERGY SERVICES, Gloucester, MA • ***Multi-Family Services Manager, 2015 – 2016***

All duties described under Senior Multi-Family Building Performance Specialist, as well as:

- Supervise multi-family energy services, including Building Performance Analysts and Heating System Coordinator
- Oversee and track expenditures of electric and gas utility funding for all multi-family energy conservation projects
- Participate in statewide energy conservation and green building best practices groups, information sharing with program administrators, other Community Action Agencies, and utility company representatives

ACTION, INC. ENERGY SERVICES, Gloucester, MA • ***Senior Multi-Family Building Performance Specialist, 2013 – Present***

All duties described under Building Performance Specialist, as well as:

- Key team member involved with the improvement of nearly 10,000 units annually through an approximately $40,000,000 annual National Grid contract, charged maintaining program budget
- Liaised between property owners/managers, contractors, multi-family program staff, and funding sources
- Ensured contractors possessed proper training, licensing, and met all program requirements
- Part of team responsible for enhancing electric conservation program with LED lamps and fixtures
- Researched and maintained knowledge of latest energy-efficient technology including air source heat pump systems

ACTION, INC. ENERGY SERVICES, Gloucester, MA • ***Building Performance Specialist, 2010-2013***

- Audited and assessed building characteristics and energy consumption to develop conservation plans for residential housing ranging from single-family homes to public and private developments of 400-plus units throughout MA
- Provided electrical assessments and information through the National Grid Appliance Management Program
- Created work scopes regarding weatherization, major repairs, lighting, and refrigerator replacements
- Reviewed and processed contractor invoices to ensure timely payment and reimbursement to ACTION by National Grid
- Participated in bidding process to ensure the highest quality work at the greatest value
- Liaised with city building inspectors and assessor offices
- Ensured existence of all properly signed contracts, permits, and other required documentation
- Execution of quality control inspections on energy conservation measures

SALEM SHEET METAL, Salem, MA • ***Fabricator-Installer, 2009***

- Fabricated copper and aluminum building products and installed custom roofing, flashings, and gutter systems

SUTHERLAND CONSTRUCTION, GENERAL CONTRACTOR, Lynn, MA • ***Carpenter, 2004 – 2009***

- Completed new home construction, remodels, and additions, conducting site prep, concrete work, framing, siding, roofing, insulation, drywall, windows and doors, finish carpentry, painting, and other areas of general construction

BRIAN J. BEOTE • 4 Wellesley Rd. Beverly, MA 01915 • 978-879-9896 • bbeote@gmail.com

MANZI AND SON, GENERAL CONTRACTOR, Salem, MA • ***Carpenter, 2001 – 2004 & 2006 – 2007***

• Applied general carpentry skills on residential and commercial general contracting projects

COMTECH ELECTRICAL CONTRACTORS, Boston, MA • ***Union Apprentice, Local 103, 1998 – 1999***

• Performed prepping, roughing out, and termination of electrical and telecommunication wires, and installed devices

EDUCATION & ADDITIONAL QUALIFICATIONS

• Bachelor of Arts in Graphic Design, Minor in Video Communications, Salem State College, Salem, MA, Spring 2006

• Proficient in Microsoft Office Suite, InDemand, XL Up, and REMRATE • Working knowledge of Spanish, Portuguese

Brendan P. Delaney

5 Rock Pond Ave. Georgetown, MA 01833 978.879.6587 Bdelaney2288@gmail.com

Summary

Energy conservation, construction, and building science professional with a total of 18 years of experience. 10 years of experience working at Action Inc. beginning as a building energy specialist in 2011. Robust knowledge in residential building science, building construction, diagnostic testing, HVAC design, program management and policy development.

Employment History

Residential Program Director – Action Energy Inc., Gloucester, MA 2020-Present

- Supervision and management of Action Inc.'s residential energy program consisting of 20+ employees.
- Direct oversight of residential program unit and budget goals.
- Statewide oversight of 19 sub-agencies to ensure successful delivery of energy services and program goals.
- Actively participate in policy and program design including implementation on a statewide level.
- Coordination with National Grid as their LEAD vendor for the income eligible energy efficiency program

Technical Manager – Action Energy Inc., Gloucester, MA 2016 - 2020

- Oversight of 5+ home energy professionals in coordination of the WAP, HWAP, and Utility funded energy programs.
- Assisted DHCD and other Community Action Agencies in developing new program measures and pricing.
- Performed trainings with the residential energy auditors to ensure they have the necessary knowledge and skills to successfully deliver services to eligible customers.
- Coordinated the DOE WAP Program allocations based upon funding limits, priority levels, and cost averages.

Building Performance Specialist – Action Energy Inc., Gloucester, MA 2011 – 2015

- Performed detailed home energy assessments to identify energy upgrade opportunities such as insulation, air sealing, window & door replacements, heating system upgrades, etc.
- Liaise with contractors to oversee the installation of measures to ensure quality and safety.
- Supervise projects to completion including final quality control inspections of installed measures, combustion safety testing/building diagnostics, and invoicing & reporting of completed work.

Carpenter – Regatta Construction Inc., Marblehead, MA 2010–2011

Carpenter – Riordan Construction Inc., Salem, MA 2009–2010

Paver / Carpenter – Thomas Blackler Construction, Marblehead, MA 2007

Carpenter – W.B. Delaney & Sons Construction, Swampscott, MA 2004–2006

Education & Additional Qualifications

- North Bennet Street School, Carpentry Program 2008
- Proficient in Microsoft Office Suite
- Proficient in Adobe Suite

Certifications

- BPI Building Analyst
- BPI Envelope Shell Professional
- BPI Quality Control Inspector
- MA DOE Energy Auditor
- MA Oil Burner Technician
- Lead Safe Renovator – Supervisor
- OSHA 10

Orest Manzi IV

178 Tremont Street Boston, MA 02111 (617-348-6468) orest.manzi@bostonabcd.org

Experience

2022-Present

Deputy Director, Field Operations, Climate Equity & Impact Department (ABCD) Boston, MA 02111
Responsible for statewide utility & local DOE funded single family WX, ASHP and Heating system projection, as well as multifamily projects. Manage grant programs. Develop and implement immerging technologies. Oversee all technical staff, vendors and installation standards

2017- 2021

Manager of Statewide Utility Programs Field Operations (ABCD) Boston, MA 02111
Responsible for statewide utility funded single family WX, ASHP and Heating system projection. Manage grant programs. Develop and implement immerging technologies.

2015-2017

Project Management and Reporting Analyst (ABCD) Boston, MA 02111
Responsible for conducting Single Family / Multi Family WX audits and project management.
Utility reporting systems data entry.

2010-2015

Multi Family Building Analyst (ABCD) Boston, MA 02111
Responsible for conducting Single Family / Multi Family WX audits and project management.

2008 - 2010

Single Family Building Analyst (ABCD) Boston, MA 02111
Responsible for conducting single family WX audits and project management.

MATTHEW KROMER

Education and Training

M.S. Technology & Policy, Massachusetts Institute of Technology, 2007
M.S. Electrical Engineering, Brown University 2000
B.S. Electrical Engineering, Brown University 2000

Research and Professional Experience

Research Lead / Director, Grid Integration· Boston, MA
Fraunhofer USA Center for Manufacturing Innovation 3/19– Present
Fraunhofer USA Center for Sustainable Energy 1/14– 3/19
Team lead for grid integration research activities at the Fraunhofer USA Center for Manufacturing Innovation (CMI). Mr. Kromer's research focuses on developing and piloting software and systems that enable the deployment of Distributed Energy Resources (DERs) at scale. Selected projects:

SunDial: Develop and pilot control topology and software that integrates control of battery energy storage, solar PV, and flexible building loads to support deployment of solar PV on renewables-dominant distribution grids.

Home Energy Electricity and Gas Appliance Monitoring: Design and deploy a sensor network at 100 homes to monitor appliance electricity use to and non-intrusively decompose whole-home gas data into constituent end-uses.

Boiler System Optimization Fault Diagnostic and Detection Tool: Development of a data analytics tool that identifies common boiler faults in multi-family buildings.

Plug & Play PV: Develop a rooftop PV system that can be purchased, installed, and commissioned by homeowners without the need to engage external contractors.

Engineering Consultant · Cambridge, MA 12/12– 12/13
Various Clients
Technical consultant engaged in renewable grid integration; design and implementation of demand-side programs; and critical infrastructure/microgrid design for clients in the public, private, and non-profit sectors.

Advanced Technologies Program Manager · Boston, MA 2/11 – 10/12
Satcon Technology Corp
Responsible for securing funding for and executing advanced development projects for a leading solar power converter manufacturer. Managed a portfolio of $4M/yr of DOE- and state-funded projects to support the development of grid-smart inverter technologies with a focus on mitigating renewable intermittency, integration of energy storage, implementing intelligent communications and control methods, and reduce the installed cost of solar power generation.

Senior Technologist*,* Clean Energy & Fuels Group · Cambridge MA 10/07 – 2/11
TIAX, LLC
Engaged in assessment of emerging energy technologies in the transportation and power generation sectors for government and corporate clients. Conducted Lifecycle and techno-economic analysis of transportation fuels, vehicle technologies, and smart grid technologies. Managed multiple contracts for the DOE's hydrogen program, and developed multiple energy infrastructure modeling tools.

Software Engineer · Cambridge MA 3/02-9/05
Draper Laboratory
Embedded software and systems integration engineer. Deployed real-time digital signal processing, avionics, and telemetry systems for guided munitions and remote sensing applications.

Selected Publications

Kromer, M, Roth, K, Boch, J. *SunDial Integration of Building Load Management, Solar PV, and Energy Storage to Support the Electric Grid: Lessons from a Field Pilot.* ACEEE Summer Study on Energy Efficient Buildings. August 2022.

Kromer, M, and Roth, K. *Evaluation of Time-Series Load-Prediction Methodologies to for Optimal Energy Storage Dispatch in Solar-Dominant Distribution Grids.* ACEEE Summer Study. August 2020.

Kromer, M, Roth, K, Yip, T. *Optimizing DER Dispatch in a Renewables Dominant Distribution Network Using a Virtual Power Plant.* 2020 IEEE Power & Energy Society General Meeting (PESGM). Montreal, Canada. August 2020.

Kromer, M, Roth, K, Zeifman, M, Yip, T, Boch, J, Arafa, S, Shishmanian, A, Woodard, J. *SunDial – An Integrated SHINES System to Enable High-penetration Feeder-level PV.* OSTI Technical Report DOE-FRAUNHOFER-0007164-1. Jan 31, 2020.

Zeifman, M, Kromer, M., Roth, K. *Integrated system to enable high-penetration feeder-level PV: Preliminary design and simulation results*. Power & Energy Society Innovative Smart Grid Technologies Conference (ISGT), 2017 IEEE.

Kromer, M, et al. 2016. *Reducing the Cost of Residential-Scale PV Through "Plug & Play PV" Systems and Standardized Electronic Workflows. Proc. IEEE PVSC 2016*. June.

Kromer, M, Choudhary, S, Wittwer, C, Braam, F, and Kohrs, R. *Enabling High Penetration PV through Tightly Integrated Behind-the-Meter PV/Storage Systems: Emerging Trends from Germany.* IEEE SmartGrid Bulletin. January 2016.

Kromer, M, Hoepfner, C, and Ashmore, J. *Making Plug & Play PV Systems a Reality: A Framework for Driving Down the Cost of Residential Solar Installations in the United States.* White Paper commissioned by DOE. Dec 2015. https://cdn2.hubspot.net/hubfs/55819/PnP/Making_Plug_and_Play_PV_Systems_a_Reality.pdf?t=1480954768678

Mather, B, Kromer, M, and Casey, L. *Advanced photovoltaic inverter functionality verification using 500kW Power Hardware-in-Loop (PHIL) complete system laboratory testing.* Submitted for publication in the Innovative Smart Grid Technologies Conference, Feb 2013.

Mossoba, J., Kromer, M., at al. *Analysis of solar irradiance intermittency mitigation using constant DC voltage PV and EV battery storage*. Transportation Electrification Conference and Expo (ITEC), 2012. IEEE, Pp 1-6.

Kromer, M, Mossoba, J, Casey, L, Rawson, M, Berkheimer, J. *Grid-Interactive PV System with an Integrated DC-Linked Energy Storage System*: *System Design Report.* Satcon Technology Corporation. Prepared for the California Energy Commission under Contract 500-10-062. June 2012.

Mossoba, J, Kromer, M, Faill, P, Katz, S, Borowy, B, Nichols, S, Casey, L, Maksimovic, D, Traube, J, Lu, F. *Analysis of solar irradiance intermittency mitigation using constant DC voltage PV and EV battery storage*. Transportation Electrification Conference and Expo (ITEC), 2012. IEEE, Pp 1-6.

Casey, L, Levi, M, Nichols, S, Kromer, M, Mossoba, J, Huang, J, Hunt, G, Perkinson J, and Borowy, B. *Grid Integration of Electronic Devices & Systems at Medium Voltage.* Powercon 2012. Auckland, NZ. Oct 2012.

Kromer, M, Bandivadekar, A, Evans, C. *Long-term greenhouse gas emission and petroleum reduction goals: Evolutionary pathways for the light-duty vehicle sector.* Energy Volume 35, Issue 1, January 2010, Pages 387-397.

Kromer, M, Rhodes, T, Joseck, F, Guernsey, M. *Evaluation of a Platinum Leasing Program for Fuel Cell Vehicles.* International Journal of Hydrogen Energy . 34(19):8276-8288. October 2009.

Kromer, M., & Heywood, J. B. (2008). *A Comparative Assessment of Electric Propulsion Systems in the 2030 US Light-Duty Vehicle Fleet*. SAE Technical Paper 2008-01-0459. SAE 2008 World Congress, Detroit, MI, April 14-17, 2008. (*Commendation for outstanding contributions at SAE World Congress 2008*)

Bandivadekar,A, Cheah, L, Evans, C, Groode, T, Heywood, J, Kasseris, E, Kromer, M, Weiss, M. *Reducing the fuel use and greenhouse gas emissions of the US vehicle fleet.* Energy Policy 36, Issue 7, July 2008, Pages 2754-2760.

Kurt W. Roth, Ph.D.

EDUCATION

1991 Ph.D. in Mechanical Engineering, Massachusetts Institute of Technology. Concentration: Fluid-Thermal Science. Thesis Title: "Deposition and Dispersion of Inertial Aerosols in Secondary and Turbulent Flow Structures."

1989-1991 S.M. in Mechanical Engineering, Massachusetts Institute of Technology

1985-1989 S.B. in Mechanical Engineering, Massachusetts Institute of Technology

EXPERIENCE

2009 – Present *Head, Energy Systems, Fraunhofer USA* *Brookline, MA*

Dr. Roth leads Fraunhofer's work to research, develop, demonstration and evaluate next-generation energy-saving building technologies and practices. He has led several DOE-funded technology development projects, including:

1) DOE-SETO SHINES: Development and demonstration on a National Grid feeder of integrated control of flexible C&I loads, 1MW PV, and 0.5MW/1.0MWH storage to accommodate high penetration solar PV in the distribution grid (co-PI);

2) DOE-BTO Building America: Developed algorithms to analyze communicating thermostat data to perform remote home energy assessments and provide targeted, customized customer outreach (co-PI);

3) DOE-BTO BA: Development of a remote, automated boiler system performance analytics tool for multi-family buildings (lead sub, ongoing);

4) DOE-BTO Advanced Building Construction: Develop and demonstrate an integrated process to digitalize and dramatically reduce the cost and installation time of deep exterior wall insulation retrofits using laser scanning and augmented reality (co-PI, ongoing).

In addition, he and the Energy Systems team play a major role in designing and modeling the impact of / evaluation, measurement & verification (EM&V) of connected AC, water heating, EV charging, and battery energy storage for the Winn / Open Market ESCO DOE-BTO Connected Communities project. He and the team are also conducting an appliance field-monitoring study for LBNL collecting 5-second power and gas and water consumption data from a range of appliances in 104 homes (~95 million data points/day).

Dr. Roth has presented the results of these studies at dozens of conferences and meetings, and has authored more than 60 "Emerging Technology" articles for the *ASHRAE Journal*. He served on the DOE Buildings of the Future Steering Committee (2014-2015) and serves on the Worcester Polytechnic Institute (WPI) Architectural Engineering Advisory Board (2015-present) and the Massachusetts Global Warming Solutions Act Implementation Advisory Committee (2019-present).

2002-2009 *Principal, Associate Principal, and Senior Technologist, Appliance and Building Technologies, TIAX LLC*

2000-2002 *Manager, Appliance and Building Technologies, Arthur D. Little, Inc.*

Technology Assessment: Technical and Project Lead for projects funded by the U.S. Department of Energy, Building Technology Program (DOE/BT) and other organizations to evaluate the energy savings potential, economics, commercialization barriers, non-energy benefits, and promising technology development opportunities of building technologies. Worked with organizations to understand their needs, develop relevant statements of work, and compose proposals to obtain funding. Projects included:

- "Energy Savings Opportunities from Integrated Control of Building Systems"
- "Energy Impact of Commercial Building Controls and Performance Diagnostics: Market Characterization, Energy Impact of Building Faults and Energy Savings Potential"
- "Energy Consumption Characteristics of Commercial Building HVAC Systems: Energy Savings Potentials"
- *Building Energy Consumption Characterization*: Developed bottom-up estimates of energy consumption of consumer electronics and miscellaneous loads.

SELECTED RELEVANT PUBLICATIONS

"SunDial Integration of Building Load Management, Solar PV, and Energy Storage to Support the Electric Grid: Lessons from a Field Pilot." (2022). Kromer, M. and K. Roth. *Proc. ACEEE Summer Study on Energy Efficiency in Buildings.* Aug.

"Digitalization of Deep Wall Retrofits: An Integrated Insulated Panel Block (PB) System and Process" (2022). Briggs, J., A. Sharpe, H.C. Fennell, K. Roth, and A. Sharon. *Proc. ACEEE Summer Study Energy Efficiency Bldgs.* Aug.

"Almost DIY: A nonintrusive way to integrate homes with the electric grid" (2022). Zeifman, M., H. Fontenot, K. Roth, et al. *Proc. ACEEE Summer Study Energy Efficiency Bldgs*. Aug.

"When Two Isn't Better Than One: Algorithms to Remotely Identify Insulation and Air Sealing Retrofit Opportunities in Homes with Two Communicating Thermostats." (2020) Zeifman, M., A. Lazrak, and K. Roth. *Proc. ACEEE Summer Study Energy Efficiency Bldgs*. Aug.

"Seeing the Future: Evaluation of Time-Series Load-Prediction Methodologies for Optimal Energy Storage Dispatch in Solar-Dominant Distribution Grids." (2020) Kromer, M, and K. Roth. *Proc. ACEEE Summer Study Energy Efficiency Bldgs*. Aug.

"Gas Demand Response - To Scale or Not to Scale, that is the Question: Findings from a C&I Pilot". (2020). Zeifman, M., K. Roth, O. Brady-Traczyk, and J. Abreu. *Proc. ACEEE Summer Study on Energy Efficiency in Buildings. Aug.*

"Optimizing DER Dispatch in a Renewables Dominant Distribution Network Using a Virtual Power Plant". (2020) Kromer, M, K. Roth, and T. Yip. *Proc. 2020 IEEE Power & Energy Society General Meeting (PESGM).* Montreal, Canada. Aug.

"SunDial – An Integrated SHINES System to Enable High-penetration Feeder-level PV". (2020) Kromer, M., K. Roth, et al. Final Report to the U.S. Department of Energy Solar Energy Technology Office. Jan.

"Residential retrofits at scale: opportunity identification, saving estimation and personalized messaging based on communicating thermostat data". (2019). Zeifman, M., A. Lazrak, and K. Roth. *Energy Efficiency*. May. pp. 1-13.

"Cold Climate Air Source Heat Pumps with Energy Storage: Evaluating the Impacts of a Carbon Reduction Strategy for New England". (2019) Urban, B. and K. Roth. *Proc. Building Simulation*. Sept.

"Energy Impact of Commercial Building Controls and Performance Diagnostics: Market Characterization, Energy Impact of Building Faults and Energy Savings Potential" (2005) Roth, K., *et al.*, Final Report by TIAX LLC to DOE-BTP. Nov.

Bryan J. Urban

EDUCATION AND TRAINING

2007 S.M. in Mechanical Engineering, Massachusetts Institute of Technology
2004 B.S. in Mechanical Engineering, Cornell University

PROFESSIONAL EXPERIENCE

2008-Present Senior Engineer, Fraunhofer USA Center for Manufacturing Innovation

- PI on four U.S. Department of Defense (DoD) Environmental Security Testing Certification Program (ESTCP) awards (EW-201513, EW-201718, EW19-5095, EW23-B9-7876) validating a compressor controls retrofit, automated IoT lighting controls platform, HVAC analytics platform, and Managed BACnet for zero-trust interoperable cybersecurity in building automation.
- Subject matter expert on advanced lighting controls serving technology transfer and training.
- Leads emerging building technology field evaluations to assess energy performance and user acceptance, improve system designs, and inform policymaking. Topics include radiator controls, smart thermostats, advanced insulation, HVAC analytics, and connected lighting.
- Leads corporate and project cybersecurity compliance efforts for CMMC, NIST 800-171, and Risk Management Framework, for IT systems and Facility-Related Control Systems.
- Business Development: propose research initiatives, organize project teams, recruit partners, develop projects, lead proposals, and manage projects.
- Designs and implement laboratory and field testing experiments for energy, indoor air quality, and thermal testing of building and control systems. Perform simulation-based analysis for verification and modeling of energy savings potential and assessment of cost effectiveness in conjunction with experimental work.
- Simulates whole-building energy and thermal performance of advanced building concepts using commercial and custom software tools. Example areas include phase change materials, heat storage, advanced windows, dynamic insulation, integrated photovoltaics, and thermal bridging.

2006-Present Director, STG International

- Co-developed a patent-pending solar energy cogeneration system for rural clinics that can be built locally from HVAC supplies. Led a solar energy market study in Lesotho.

2004-2008 Research Assistant, MIT Building Technology Laboratory

- Initiated a real-time electricity metering and behavioral feedback project in campus dorms. Managed a team of students, faculty, and facilities to install equipment and develop software for displaying real-time electricity usage data on campus.

2003-2004 Researcher, Cornell University

- Constructed a thermo-chemical computer simulation model to characterize a new way of producing hydrogen gas and predicted and calculated an optimally efficient reactor temperature.

PUBLICATIONS

Urban, B. (2022). More Light, Less Energy: Fully-Integrated Wireless LED Controls for DoD Interior Lighting Applications. *ASHRAE 2022 Winter Conference.*

Urban, B. and K. Roth. (2019). Cold climate air source heat pumps with energy storage: evaluating the impacts of a carbon reduction strategy for New England *Proc. Building Simulation 2019: 16th Conf. of IBPSA.* Rome, Italy. Sept.

Urban, B. (2018). Validating the COOLNOMIX AC and refrigeration compressor control retrofit. Project No. EW-201513. *Final Report to DoD/ESTCP*. Nov.

Urban, B. (2020). Beware the Fans: Lessons from a Compressor Controls Evaluation. *Proc. ACEEE Summer Study on Energy Efficiency in Buildings.* Aug.

Zeifman, M., B. Urban., and K. Roth. (2017). Communicating thermostats as a tool for home energy performance assessment. *Proc. 2017 IEEE Intl. Conf. on Consumer Electronics*. Jan.

Urban, B. and K. Roth. (2014). A Data-Driven Framework for Comparing Residential Thermostat Energy Performance. *Final Report to Nest Labs.* Jul.

Urban, B., N. Shukla, A.D. Fontanini, and J. Kosny. (2015). Measuring field performance of Aerogel insulation in a hot, dry climate. *Proc. of the BEST 4 Conference: Building Enclosure Science & Technology*. Kansas City, MO. Apr.

Urban, B., N. Shukla, A. Fontanini, and J. Kosny. (2014). An Outdoor Hut Testing Platform for Evaluating Advanced Building Enclosures. *Proc. of the 10th Nordic Symposium on Building Physics.* 135-43. Jun.

Urban, B. and C. Gomez. (2013). A Case for Thermostat User Models. *Proc. of Building Sim 2013, 13th Conference of International Building Performance Simulation Association.* Chambéry, France. 1483-90. Aug.

Urban, B. and D. Elliott. (2012). Towards Better Modeling of Residential Thermostats. *Proc. of the 5th National IBPSA-USA Conference.* Madison, WI. Aug.

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Urban, B. (2007). Energy Reduction in Buildings through Education of Designers and Occupants. *Proc. of the AGS Annual Meeting 2007*. Barcelona, Spain. Mar.

PATENTS

Orosz, M., A. Mueller, E. Wayman, H. Jacobus, and B. Urban. (2012). Solar Collection and Conversion System and Methods and Apparatus for Control Thereof. United States Patent US 8,132,409. Mar.

AWARDS

Integrated Lighting Campaign, Advanced Sensors and Controls Recognition	2021
Clean Energy Prize Finalist	2012
Conoco Philips Energy Prize Winner	2010
Martin Family Sustainability Fellowship	2007
MIT $50k Competition Finalist	2006
Alliance for Global Sustainability Best Poster	2006
LIFE Research Grant Recipient	2003

ACTIVITIES AND OUTREACH

- Professional Affiliations: ASHRAE, IBPSA-USA, Consortium for Energy Efficiency
- MA Global Warming Solutions Act Task Force
- MA Governor's Net Zero Energy Task Force
- Scientific committee for e-SIM conference
- Scientific Advisory Board for Open Source Building Science Sensors
- VentureWell Program Startup Mentor

Hannah C. Fontenot, Ph.D.

EDUCATION

2021 Ph.D. in Mechanical Engineering, Syracuse University. *Dissertation Title*: "Exploiting building demand flexibility through machine learning for building-to-grid integration." *Advisor*: Prof. Bing Dong.

2019 M.S. in Mechanical Engineering, University of Texas at San Antonio

2015 B.S. in Aerospace Engineering, Texas A&M University

EMPLOYMENT

2022–Present Project Engineer, Fraunhofer USA

- Developing a thermal comfort prediction model to be integrated into HVAC energy flexibility model.
- Developed a hybrid physics-based/data-driven approach to predict residential PV production, accounting for clouds and stationary shading objects, and validated/tested this approach on real-world data.
- Developed a physics-informed, mostly data-driven approach to infer thermostat schedule, model heat pump energy flexibility, and predict heat pump power use for arbitrary thermostat schedules using challenging residential heat pump data sets (specifically, missing/unreliable indoor temperature data).

2019–2021 Research Assistant, Built Environment Science & Technology (BEST) Lab, Syracuse Univ.

- Developed a deep learning-based building model for use in model predictive control scheme for room-level HVAC equipment. Tested the model and control algorithm in simulation and field study.
- Performed data analytics on large-scale dataset of residential customer energy use in order to identify impact of PV and battery installations on load profiles. Developed insights and identified lessons/opportunities for utility providers in developing PV-based customer programs.
- Developed, and tested new energy forecasting algorithms for selected commercial buildings

2016–2019 Research Assistant, BEST Lab, UTSA

- Developed a framework coupling commercial and residential buildings, solar PV generators, and battery energy storage systems to the power distribution network.

PUBLICATIONS

Widjaja, R. F., Wu, W., Zhou, Z., Sun, R., Fontenot, H. C., & Dong, B. (2023). A general spatial-temporal framework for short-term building temperature forecasting at arbitrary locations with crowdsourcing weather data. In *Building Simulation* (pp. 1-20). Tsinghua University Press.

Zeifman, M., Fontenot, H., Roth, K., Leclerc, D., Taylor, S., Zavaliagkos, G., Ozcan, E.C., & Paschalidis, E. (2022). Almost DIY: A nonintrusive way to integrate homes with the electric grid. In *Proceedings of the 2022 ACEE Summer Study on Energy Efficiency in Buildings*. Aug.

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Fontenot, H., Ayyagari, K. S., Dong, B., Gatsis, N., & Taha, A. (2020). Buildings-to-Distribution network integration to enable voltage regulation considering renewable energy resources. In *2020 Building Performance Analysis Conference and SimBuild*.

Prakash, V., Fontenot, H., Khan, A. A., Dong, B., & Alamaniotis, M. (2020). Ensemble Method for Short-Term Load Forecasting Using LSTM, SVR, and FFNN Taking into Account Seasonal Dependency. *ASHRAE Transactions*, *126*(1).

Fontenot, H., Dong, B., Aradillaz, K., Pineda, G., Li, Z., & Jiang, T. (2019). Nationwide Evaluation of Potential Energy Savings and Payback of Integrated Building and Battery Energy Storage System through Model Predictive Controls. *Build Simul*, *2020*, 1659-1666.

Fontenot, H., & Dong, B. (2019). Modeling and control of building-integrated microgrids for optimal energy management–a review. *Applied Energy*, *254*, 113689.

Dong, B., Yan, D., Li, Z., Jin, Y., Feng, X., & Fontenot, H. (2018). Modeling occupancy and behavior for better building design and operation—A critical review. In *Building Simulation* (Vol. 11, pp. 899-921). Springer Berlin Heidelberg.

AWARDS

Presidential Distinguished Research Fellowship, UTSA *2018–2019*

AFFILIATIONS

ASHRAE, IBPSA

IREC
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INTERSTATE RENEWABLE ENERGY COUNCIL

Cynthia Finley
Vice President, Workforce Strategies and Innovation
cynthiaf@irecusa.org

Professional Experience

Interstate Renewable Energy Council 2023-present
Vice President

Virginia Community College System
Director of Workforce Programs & Partnerships

- Designed and implemented data-driven programs focused on the expansion of Virginia's workforce, with special focus on underserved populations.
- Created solutions through program design, implementation and coordination of training and career pathways development, to prepare students for in-demand industry jobs with family-sustaining wages. Collaborated with and led stakeholders towards developing scalable education and workforce solutions, improving the lives of underserved populations.
- Directed the Virginia Infrastructure Academy with the strategic goal of addressing employer needs while meeting the needs of underserved student populations.
- Cultivated and nurtured partnerships with diverse stakeholders from industry, community leaders, and educational institutions.
- Researched and communicated funding opportunities, policy, industry forecasts, and benchmarking to deliver innovative solutions to stakeholders and partners.

Virginia's Commonwealth Attorney
Director of Programs

Education

- PhD Candidate, Old Dominion University
- Masters Degree, Virginia Commonwealth University
- Bachelor of Science, Virginia Tech

Professional Affiliations

Virginia Energy Workforce Consortium
National Grants Management Association

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INTERSTATE RENEWABLE ENERGY COUNCIL

Kristen Hagerty
Senior Director of Workforce Development
Kristenh@irecusa.org

Professional Experience

Kristen brings 18 years of experience in clean energy and workforce development. She studies trends and root causes of complex issues to identify technical and non-technical solutions that can be achieved through strategic collaboration. As Senior Director, she:

- Serves as Principal Investigator for EMPOWERED, a $2.1 M workforce development project jointly funded by the DOE Offices of Building Technologies, Solar Energy Technologies, and Vehicle Technologies
- Supervisory responsibilities include the direct management of two IREC staff and the past management of a team of twelve contract assessors for IREC's Credentialing Program
- Supports internal initiatives to strengthen IREC's workplace culture and organizational impact as an integral part of the senior management team
- Advises on workforce and training-related aspects of projects from all IREC programs
- Cultivates strategic partnerships with a wide range of workforce stakeholders.

Recent Instructional Design Accomplishments

- Job-specific technical training and concise educational resources for the safe integration of Distributed Energy Resources (DER) in a variety of formats
- Training for contractors and inspectors to use the SolarAPP+ permitting tool
- Hybrid training for the Weatherization Assistance Program's Training Centers
- Instructional design and program evaluation of face-to-face training for code officials and first responders
- Code official training for Solarize Mass Quality Assurance and Training Program
- Self-paced e-learning interactive video modules for PV inspection
- Directed the creation of two clean energy standards for training and instructors

Education

M.E.T | BOISE STATE UNIVERSITY, BOISE - Masters of Educational Technology; Instructional Design with Technology Integration Specialist Certificate
B.S.E | TULANE UNIVERSITY, NEW ORLEANS - Major: Mechanical Engineering

Relevant Volunteer Experience

Town of Concord Diversity, Equity, and Inclusion Committee (2022-present)
Town of Concord Planning Board 2017-2022 (Chair 2020-2021)

March 15, 2023

Maria Robinson, Director
Grid Deployment Office
U.S. Department of Energy
1000 Independence Ave. SW
Washington, DC 20585

Re: Support for Grant Application of Generac Grid Services

Dear Director Robinson:

As the Massachusetts Energy Efficiency Program Administrators ("PAs"),[1] we write in strong support of the application of Generac Grid Services for a grant from the Grid Resilience and Innovation Partnerships ("GRIPs") Program.[2] We believe that Generac's proposal exemplifies the collaborative, innovative projects Congress intended to promote in adopting Section 40103(b) of the Bipartisan Infrastructure Law. Teaming with the Low-Income Energy Affordability Network ("LEAN"), the Massachusetts Clean Energy Center, and the PAs, Generac's GRIPs proposal will accelerate the deployment of a comprehensive set of resilience technologies for low- and moderate-income ("LMI") customers in Massachusetts. The PAs believe they will learn important lessons from the implementation of Generac's proposal that they can use in considering future statewide programs. As entities regulated by the Massachusetts Department of Public Utilities ("DPU"), our support is necessarily conditioned upon the requirement that we must abide by DPU directives and policies. We believe that our support is consistent with such directives and policies, especially given that Generac's proposal leverages and coordinates with existing approved program offerings.

Generac's proposal complements and builds on the work the PAs are already doing with our stakeholder partners to accelerate the transition to clean energy. The rapid deployment of heat pumps is central to the PAs' 2022-24 Three-Year Energy Efficiency Plan and Massachusetts's broader strategy for meeting its 2030 clean energy and greenhouse gas emissions targets. DOE funding for Generac's grant application would accelerate and build on these deployments by pairing innovative grid-edge technologies like home batteries and controllable thermostats with heat pumps that have recently been or will be installed using PA incentives. Combining and deploying these technologies at the scale Generac proposes through this grant—adding heat pumps, batteries, and controllable thermostats to some 2,000 homes—will deliver resilience benefits both to individual homes and to the grid as whole through coordinated demand response.

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1 The Massachusetts Program Administrators are: The Berkshire Gas Company, Fitchburg Gas & Electric Light Company d/b/a Unitil, Liberty Utilities (New England Natural Gas Company) Corp. d/b/a Liberty, Massachusetts Electric Company, Nantucket Electric Company, Boston Gas Company and former Colonial Gas Company, each d/b/a National Grid, NSTAR Electric Company, NSTAR Gas Company and Eversource Gas Company of Massachusetts, each d/b/a Eversource Energy, and Cape Light Compact JPE.

2 Generac's project is named: "Accelerating building thermal electrification while managing system impacts." DE-FOA-0002740.

The data Generac collects while implementing this grant will provide valuable lessons as the PAs plan future offerings that can be deployed at scale. Analyzing these data can help optimize future program designs, focusing expenditures on programs that deliver optimal results in the field.

Of note, one PA, the Cape Light Compact, recently received regulatory approval to launch the Cape and Vineyard Electrification Offering, which will deploy heat pumps, rooftop solar, and electric appliances to LMI homes. A limited number of the participating homes will receive batteries. If funded, this Generac grant would facilitate the inclusion of batteries for all participating CVEO customers, without additional costs to customers. This is an important benefit for Cape Light Compact customers.

Critically, Generac's focus on providing batteries to LMI customers aims to ensure that the benefits of the clean energy transition are accessible to all, consistent with the PAs' own focus on equity. This funding would also support the PAs' efforts to create business-ownership and employment opportunities for diverse communities, building on the PAs' current support for the Clean Energy Pathways program and the Community First Partnership program. Because of our close, existing relationships with communities and stakeholders across the state, we could assist in assuring that this funding could be deployed efficiently and equitably.

We look forward to working with the Department of Energy, Generac, and our other partners in energy efficiency to gain valuable insights into the best ways to deploy demand reduction technologies and heat pumps in Massachusetts. We urge you to fund Generac's application.

Sincerely,

The Massachusetts Program Administrators

Katherine Peters /EL

Katherine Peters
Director, Massachusetts Implementation
Eversource Energy

Christopher Porter /EL

Christopher Porter
Director, Customer Energy Management
National Grid

Cindy L. Carroll /EL

Cindy L. Carroll
Vice President, Customer Energy Solutions
Unitil Service Corp.

Hammad Chaudhry /EL

Hammad Chaudhry
Senior Manager
The Berkshire Gas Company

Kimberly Dragoo /EL

Kimberly Dragoo
Senior Manager, Energy Efficiency
Liberty Utilities

Margaret T. Downey /EL

Margaret T. Downey
Administrator
Cape Light Compact JPE

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF
ENERGY AND ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENERGY RESOURCES
100 CAMBRIDGE ST., 9th FLOOR
BOSTON, MA 02114
Telephone: 617-626-7300

Maura T. Healey
Governor

Kimberley Driscoll
Lt. Governor

Rebecca L. Tepper
Secretary

Elizabeth Mahony
Commissioner

March 15, 2023

Grid Deployment Office
United States Department of Energy
Washington, DC 20585

RE: Letter of Support for Generac Grid Services regarding the Deployment of Technologies to Enhance Grid Flexibility (Smart Grid Grants)

The Massachusetts Department of Energy Resources (DOER) is pleased to provide this Letter of Support to Generac Grid Services and its partners as it pursues funding under the Grid Resilience and Innovation Program's Topic Area 2: Smart Grid Grants provided by the U.S. Department of Energy (DOE) Grid Deployment Office (GDO). The proposed project seeks to pair batteries and smart thermostats with the large number of heat pumps that are being rolled out as part of the MassSave efficiency plans in order to meet the state's Net Zero goal by 2050. The goal is to investigate the extent that coordinated distributed energy resources assets controlled in virtual power plants can impact the new load, the distribution and transmission system, help achieve decarbonization goals, and increase resiliency and reliability. DOER determined that the applicant has considered and demonstrated that the proposed project meets clean energy goals for the Commonwealth of Massachusetts. This applicant demonstration is the basis for DOER providing this Letter of Support.

DOER is an agency of the Executive Office of Energy and Environmental Affairs. DOER's mission is to create a clean, affordable, equitable and resilient energy future for all residents, including low-income and Environmental Justice populations, businesses, communities, and institutions in the Commonwealth. To meet these objectives, DOER develops and implements policies and programs to ensure the adequacy, security, diversity, and cost-effectiveness of the Commonwealth's energy supply. DOER is committed to working to promote energy programs and policies that are developed and implemented to ensure environmental justice among all the Commonwealth's citizens, communities, businesses, and institutions. DOER provides letters of support to projects that achieve the energy goals of the Commonwealth.[1]

The Bipartisan Infrastructure Law, also known as the Infrastructure Investment and Jobs Act, includes new DOE programs and funding opportunities, several of which will be administered by the DOE's Grid Deployment Office and the Office of Clean Energy Demonstrations. For funding opportunities where DOER is not an applicant or a partner to an applicant, DOER welcomed applicants to submit a Request

[1] Please note this Letter of Support does not commit DOER to the proposed project, nor does it imply any commitments of state funding or project management.

for a Letter of Support about how the proposed project meets DOER and Commonwealth of Massachusetts energy goals.

Generac Grid Services requested a Letter of Support from DOER for their project application to the Grid Resilience and Innovation Program's Topic Area 2: Smart Grid Grants provided by the U.S. DOE GDO. DOER has reviewed the proposed project, as submitted to DOER on February 27, 2023, and finds that it addresses the following Commonwealth energy goals:

1. **Clean Energy and Emission Reduction** by accelerating deployments of heat pumps through the Mass Save program and by increasing solar self-consumption which is especially important in New England where the largest source of electric generation is natural gas.
2. **Energy Reliability and Resilience** by increasing resilience at both the household and system level. This project will provide batteries to low- and moderate-income (LMI) customers in addition to heat pumps which helps provide resilience at the individual household level. The fleet of batteries and other controllable DERs from this project will be aggregated into Virtual Power Plants (VPPs) that will be dispatched when there are possible constraints on the electric system. This should help increase resilience at the system level.

- **Energy Affordability** by providing a direct economic benefit to the customer for those customers that are replacing oil or propane heating systems with heat pumps through lower heating costs. Additionally, the project may provide beneficial economic impacts through persuading people to install heat pumps.
- **Energy Equity** by focusing on LMI customers with a heavy emphasis of serving those customers that are located in Environmental Justice Communities. By partnering with community action agencies like ABCD, the project team will be able to reach those customers that are potentially most vulnerable to the impacts of climate change.
- **Environmental Impacts** by reducing onsite combustion of fossil fuels for heating purposes and when all the systems are aggregated and dispatched, potentially negating the need to run inefficient peaker plants. This is further expected to have air quality and public health benefits. This is envisioned
- **Workforce and Economic Development** by structuring training and employment opportunities including on-the-job training, apprenticeships, and strategies for workers to gain credentials for advancement, prioritize outreach to Minority/Women Owned Business Enterprises (MWBE) contractors for program inclusion, and coordinate information sessions and recruitment events with local community colleges, trade techs, and at public housing locations.

We look forward to further discussions with the project, should it receive federal funding, to ensure integration of state policy objectives.

Signature,

Joanna K. Troy
Director of Energy Policy and Planning
Massachusetts Department of Energy Resources

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March 10, 2023

Michael Goldman
Director, Business Development and Regulatory Affairs
Generac

Re: DE-FOA-0002740, Topic Area 2: Smart Grid Grants (40107)

Dear Michael:

The Interstate Renewable Energy Council (IREC) is pleased to serve as a key partner on Generac's application to the Department of Energy's Smart Grid program with the project, **Accelerating Building Thermal Electrification while Managing System Impacts.**

An established leader for clean energy workforce development, IREC will provide strategic and technical advisement throughout the lifecycle of the project, to see that DOE's diversity, equity, inclusion, and access objectives are fully integrated into the project. Our experienced training and curriculum development specialists have strong project management skills to assist with partner engagement, inform individual assessments, provide counsel on effective strategies and models for education and training, and otherwise support local community-based organizations and utility program administrators in their involvement with this program.

For this project, IREC will be responsible for the following activities:

- Work directly with Massachusetts-based employers and community action agencies to set up a framework to identify, recruit, and prepare Justice40 community members for training and employment opportunities offered through this project. Our team anticipates we may also need to develop some outreach and educational materials for these partners to make sure that learners and trainees have a full understanding of the project's grid resilience goals.
- Leverage existing tools and resources from a learner-centric lens, with the goal of establishing a pipeline of workers for placement and advancement in high road jobs.
- Share timely insights and recommendations to help develop and strengthen the program through its maturity, to be responsive to the needs of consumers, trainers, trainees, and employers.
- Work with DOE and Generac to identify and monitor program metrics.
- Communicate with community, utility, and business partners on progress and milestone.

IREC recognizes that any funding for our organization will be negotiated upon successful grant award. Our board and staff wish Generac success in its application and look forward to working with your team and the Massachusetts energy efficiency stakeholders on this exciting grid resilience project.

Sincerely yours,

Larry Sherwood
President and CEO

Fraunhofer USA

March 13, 2023

Generac Grid Services
1515 Wynkoop St, Suite #710
Denver, CO 80202
Attention: Mr. Michael Goldman

Dear Mr. Goldman,

It is my pleasure on behalf of Fraunhofer USA to provide this Letter of Commitment for your proposal to the DOE Grid Resilience and Innovation Partnerships (GRIP) FOA, DE-FOA-0002740, "Accelerating building thermal electrification while managing system impacts", under Topic Area 2, Smart Grid Grants.

Fraunhofer USA's Energy Systems team is an established performer of applied R&D for government entities, foremost DoD and DOE. We have completed several multi-year projects to demonstrate and evaluate the field performance of building technologies and distributed energy resources (DERs), many focused on controls. For a DOE-SETO SHINES project, we developed and demonstrated a control platform that optimally shaped the net load of a virtual portfolio of DERs (three C&I loads, 1.5MW of solar PV, and a 0.5MW /1.0 MWh storage system) based on user-defined objectives over 15-months on a National Grid feeder in Massachusetts. For a National Lab, we deployed, collected, cleaned, and analyzed high-resolution real-time data from a network of >2,000 sensors with ~5,000 endpoints installed in >100 homes, for ~12 months/home. The backend data management infrastructure we developed collects and managed >90 million data points/day. We have also led four DoD ESTCP demonstration projects (two active).

Transitioning building space heating from fossil fuel-fired systems to electric heat pumps is essential to achieving our national decarbonization goals. Integrating cold-climate heat pump systems (ccHPs) with the electric grid will pose great challenges due to the sheer number and magnitude of new loads. Although modeling studies have been completed, they do not reflect the often-complex real-world performance of ccHPs. This project tackles this daunting problem head on by deploying ccHPs and HPWHs in 2,000+ homes with energy storage systems and using the Generac distributed energy resource management system (DERMS) to optimally control the portfolio to support the grid. Not only will this establish how effectively a DERMS can mitigate the grid impacts of building thermal electrification at scale, it will also provide crucial insight into the real-world performance of ccHPs in a much wider range of homes than prior field studies.

As a subawardee, we would support Generac's effort by performing rigorous evaluation, measurement and validation (EM&V) throughout the five-year project. This includes tailoring our existing tools for automated data quality control (QC) to ensure that systems installed in the field are fully operational and providing all data necessary for evaluating system performance. Our budget for this project is $2,050,485.

I hope we have the opportunity to work together on this critical project to enable decarbonization of building thermal loads at scale in a way that minimizes grid stresses while ensure occupant comfort.

Sincerely,

Prof. Andre Sharon, Ph.D.
Center Director, Fraunhofer USA Center for Manufacturing Innovation CMI

Dr. Kurt Roth
Head, Energy Systems

STATEMENT OF PROJECT OBJECTIVES (SOPO)

Accelerating building thermal electrification while managing system impacts

A. OBJECTIVES

1. Demonstrate that new electric load from heat pumps can be partially offset through the control and optimization of other household distributed energy resources such as batteries, wi-fi thermostats, and hot water control switches (where appropriate)
2. Create Virtual Power Plants in furtherance of Objective #1
3. Develop forecasts to anticipate new localized and system peaks caused by building thermal electrification
4. Develop optimization algorithms to influence the dispatch of behind the meter assets
5. Develop training programs for HVAC installers and battery installers
6. Provide resilience for LMI customers by providing them with battery backup power
7. Provide resilience for the grid by minimizing potential equipment overloads
8. Support small businesses, women and minority owned businesses

B. SCOPE OF WORK

1. Install approximately 2,000 batteries, heat pumps, wi-fi thermostats, and hot water control switches (where appropriate) in low and moderate income (LMI) households in Massachusetts
2. Use a distributed energy resource management system (DERMS) platform to control all the distributed energy resources (DERs) and dispatch them to minimize the grid facing load from heat pumps
3. Validate data reviewed from a 3rd party showing that coordinated control/dispatch of multiple behind the meter DERs offset gross impacts of new electrification load
4. Increase the size of the workforce that can audit and install heat pumps and batteries
5. Increase awareness about the benefits of heat pumps and batteries
6. Develop case studies that can be used across the country to show that building thermal electrification can be done without threating the safety and reliability of the grid
7. Accelerate the deployment of heat pumps and batteries by encouraging local jurisdictions to provide enhanced incentives when combining both types of DERs
8. Decrease the expected number of overloads on the T&D system in contingency scenarios (i.e. N-1 and N-1-1)

C. TASKS TO BE PERFORMED

Task 1.0: Project Management and Planning

Subtask 1.1 – Create Project Management Plan (PMP):

Within 30 days of award, the Recipient shall submit a Project Management Plan (PMP) to the designated Federal Project Officer (FPO). The Recipient shall not proceed beyond Task 1.0 until the PMP has been accepted by the FPO.

The PMP shall be revised and resubmitted as often as necessary, during the course of the project, to capture any major/significant changes to the planned approach, budget, key personnel, major resources, etc. The Recipient shall manage and direct the project in accordance with the accepted PMP to meet all technical, schedule and budget objectives and requirements. The Recipient will coordinate activities to effectively accomplish the work.

The Recipient will ensure that project plans, results, and decisions are appropriately documented, and that project reporting and briefing requirements are satisfied. Subtask 1.2: National Environmental Policy Act (NEPA) Compliance. As required, the Recipient shall provide the documentation necessary for NEPA compliance. Subtask 1.3: Cybersecurity Plan (CSP). The CSP shall be revised and resubmitted as often as necessary, during the course of the project, to capture any major/significant changes.

Subtask 1.2: National Environmental Policy Act (NEPA) Compliance

As required, the Recipient shall provide the documentation necessary for NEPA compliance.

Subtask 1.3: Cybersecurity Plan (CSP)

The CSP shall be revised and resubmitted as often as necessary, during the course of the project, to capture any major/significant changes.

Subtask 1.4: Manage Project Cost, Schedule, Risk

The project team will manage the specified scope using project management best practices to execute the project to the schedule and budget while minimizing risk.

Subtask 1.5: Continuation Briefing(s):

The Recipient will brief DOE on roughly an annual basis to explain the plans, progress and results of the technical effort. The briefing shall also describe performance relative to project success criteria, milestones, and the Go/No-Go Decision point that are documented in the Project Management Plan (PMP).

Task 2.0 –Customer Education and Enrollment

Subtask 2.1 – Marketing:

Define program rules and criteria for participant eligibility. Create new program website or edit existing MassSave website; develop marketing collateral and other leave-behind materials; educate community action agencies on the program offering.

Subtask 2.2 – Customer Acquisition:
Add combined heat pump and battery offer as part of in-home visits/audits; leverage existing relationships community action agencies have with customers; leverage existing relationships that the Massachusetts electric utilities and energy efficiency program administrators have with other Municipal and local agencies.

Task 3.0 – Equipment Installation

Subtask 3.1 – Heat Pump Installation
Educate and recruit existing technicians that can install heat pumps, wi-fi thermostats and hot water control switches; mitigate any pre-electrification barriers; install all the required equipment; commission smart thermostat and hot water control switch in Distributed Energy Resource Management System (DERMS)

Subtask 3.2 – Battery Installation
Educate and recruit existing technicians that can install batteries; submit interconnection request to utility for review (expected to fall under simplified review process due to small size of systems); procure battery from distributor; install battery on premises; commission battery in Distributed Energy Resource Management System (DERMS)

Task 4.0 – Asset Dispatch Control

Subtask 4.1 – Develop Forecasting Model
Obtain historical data at various system subsegments and weather data; review performance and electrical profile of heat pumps in order to create digital twin; develop a strategy on when to dispatch batteries and the specific optimization control algorithms to align dispatch with forecasted peaks.

Subtask 4.2 – Execute Asset Events
Aggregate all of the distributed energy resources into the DERMS; create Virtual Power Plants within the DERMS platform; when forecasted peaks occur initiate dispatch of assets, provide on-going monitoring and support from Network Operations Center (NOC)

Task 5.0 – Workforce Development

Subtask 5.1 – Education

Design educational materials to promote project participation. (client, auditor, and employer)

Subtask 5.2 – Outreach
Conduct outreach to increase the diversity and size of the project-related workforce

Subtask 5.3 – Workforce Development
Advise on effective ways to connect workers, community-based organizations, training, and employers. Advise on effective ways employers can retain employees and provide career pathways

Subtask 5.4 - Evaluation and Reporting
Project evaluation as it relates to workforce development**.** Document lessons learned and prepare recommendations to replicate and scale a similar program

Task 6.0 – Measurement & Verification (M&V)

Subtask 6.1 – Develop M&V Plan
Develop the plan for what will be evaluated, the measurements needed for those evaluations, and the plan to analyze the data

Subtask 6.2 – Develop Data Acquisition and Data Collection Plan
Plan to ensure the correct data is acquired at the necessary frequencies

Subtask 6.3 – Develop Data Quality Control (QC) Screening Tool
Analyzes the data flowing from the field to flag and report potential issues

Subtask 6.4 – Conduct Ongoing Data QC
Evaluate data quality every 1-2 weeks to identify potential issues for remediation

Subtask 6.5 – Baseline Development
Process pre-retrofit data to develop energy consumption baseline space and water heating baseline estimates for heat pumps

Subtask 6.6 – Conduct M&V
- Preliminary M&V in Y2 to see if there are any major issues arising with the first cohort of homes
- Repeat this in Y3, after issues w/ initial cohort are addressed and many more homes added but before it is too late to make any important changes

Subtask 6.7 – Conduct Scenario Analyses
To maximize lessons learned, team will develop models for the controlled loads based on real-world data and then exercise the model for forward-looking use cases that were

not included in the field testing. This also includes the actual-vs-ideal/perfect knowledge comparisons we mentioned.

Subtask 6.8 – Final Reporting

- Synthesizes M&V findings, lessons learned + recommendations, scenario analyses, etc. for the overall project Final Report
- Publish and present 2-3 papers at relevant conferences to help disseminate important findings

D. DELIVERABLES

Subtask 1.1: Project Management Plan
Subtask 1.3 – Cybersecurity Plan
Subtask 1.4 – Pre-Continuation Briefing Document(s)
Subtask 5.1 – Workforce Development Training Materials
Subtask 6.1 – Quantitative Assessment of Effectiveness of Orchestrating behind the Meter Loads to Offset Impacts of new Electrification Loads

In addition to the deliverables listed above, the Recipient shall submit all periodic, topical, final, and other reports in accordance with the Federal Assistance Reporting Checklist and accompanying instructions.

E. BRIEFINGS/TECHNICAL PRESENTATIONS

The Recipient shall prepare, and present periodic briefings, technical presentations and demonstrations as requested by the Federal Project Officer, which may be held at a DOE or the Recipient's facility, other mutually agreeable location, or via webinar. Such meetings may include all or a combination of the following:

Kickoff Briefing - Not more than 30 days after submission of the Project Management Plan, the Recipient shall prepare and present a project summary briefing as part of a Project Kickoff Meeting.

Pre-Continuation Briefing - Not less than 90 days prior to the planned start of a budget period, the Recipient shall brief the DOE on the results to date, and their plans for the subsequent periods of work. The DOE will consider the information from this briefing, as well as the content of deliverables submitted to date, prior to authorizing continuing the project.

Final Project Briefing - Not less than 30 days prior to the end of the project, the Recipient shall prepare and present a Final Project Briefing on the results and accomplishments of the entire project.

Other Briefings – The Recipient shall prepare and present technical, financial, and/or administrative briefings as requested by the DOE. Additionally, the DOE may require Recipients to make technical presentations at national and/or industry conferences.

ACTION FOR BOSTON COMMUNITY DEVELOPMENT

Department of Energy
Grid Deployment Office (GDO)
Re: *Grid Resilience and Innovation Partnerships: Accelerating building thermal electrification while managing system impacts.*

Dear Colleagues:

With this letter, Action for Boston Community Development Inc. (ABCD) commits to full participation in, and enthusiastic support for, the Generac Grid Resilience and Innovation Partnerships initiative.

Partnership Commitment. As a partner, ABCD will coordinate outreach, communications, enrollment and implementation strategies which effectively engage low-income and disadvantaged residents. Specific activities will include the following.

- Coordination with other Community Action Agencies, notably lead partner Action, Inc., to provide access to targeted Environmental Justice Communities;
- Analysis of lessons learned in the management of current energy efficiency programs, and identification of potential operational synergies with the GRIP initiative;
- Information and resource-sharing with regional LIHEAP programs to identify eligible residents in LMI communities;
- Customer acquisition, including development of signed customer contracts;
- Integration of combined heat pump and battery installation as part of the scope of work for eligible households engaged in other energy efficiency programs;
- Support for mitigation of any existing pre-electrification barriers before heat pump installation;
- Oversight of equipment installation; and
- Maintenance and management of customer relationships, either directly or through partnerships with other Community Action agencies;

Network Experience and Capacity. Action for Boston Community Development, Inc. (ABCD), Action, Inc., and their statewide network of partnering Community Action agencies, offer a unique combination of access to low-income communities and expertise in the management of leading-edge energy programs. Massachusetts Community Action Agencies, which share a core mission of alleviating poverty, deliver a wide range of services to Environmental Justice Communities. Among these, energy-related assistance is prominent. ABCD and its cohort of partners deliver federally-funded LIHEAP, Weatherization and HEARTWap services, as well as state-and public-utility funded projects which install newer energy conservation technologies such as multizone air source heat pumps and solar PV systems. These programs operate at scale; ABCD, for example, reaches more than 32,612 households with LIHEAP benefits and appropriate system upgrades.

Department of Energy funding for this project will create significant efficiencies in the delivery of new energy-saving technologies, will provide community benefits through workforce development and lowered energy burdens, and will directly benefit low-and-moderate-income consumers. We are pleased to be a part of it.

Sincerely,

DocuSigned by:
James P. Collins IV, M.B.A.
Director, Climate Equity & Impact Department

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March 10, 2023

U.S. Department of Energy, National Energy Technology Laboratory

Re: Letter of Support for BIL Grid Resilience and Innovation Partnerships (FOA-0002740) - Generac Proposal

To whom it may concern:

On behalf of the Massachusetts Clean Energy Technology Center (MassCEC), I am pleased to provide this letter of support for "Accelerating building thermal electrification while managing system impacts," Generac's application to the DOE BIL Grid Resilience and Innovation Partnerships FOA.

MassCEC is a quasi-public economic development agency whose mission is to grow the clean energy industry in Massachusetts, while helping the Commonwealth achieve its climate, environmental, and economic development goals. MassCEC is dedicated to accelerating the success of clean energy technologies, companies, and projects in the Commonwealth - while creating high-quality jobs and long-term economic growth for the people of Massachusetts. To that end, we run various programs to support the industry across a wide range of technology development and commercialization stages.

The proposed project seeks to demonstrate that it is possible to electrify the building thermal sector without causing system overloads, reliability issues, or needing expensive infrastructure upgrades. We are currently engaging in a broad set of efforts to support the rapid expansion of electrification in the building-thermal and transportation fields while also addressing the critical need to minimize and optimize the grid impacts of increased electrification. MassCEC is well-positioned to comment on Generac's strong eligibility for the Grid Resilience and Innovation Partnership funding opportunity.

As part of the proposed clean energy project, Generac plans to focus on training programs and including women/minority business enterprises (MWBEs) as critical installation partners. Through our Equity Workforce Programs, MassCEC funds career training for residents of environmental justice and low-income communities and support for MWBEs. Our Equity Workforce grantees not only address the need to grow Massachusetts' clean energy workforce, but they also prioritize diversity, equity, and inclusion efforts across the full spectrum of economic opportunity, yielding both an increasingly diverse bench of highly trained new workers and a wider array of thriving minority and women-owned business enterprises to help lead climate-critical work. These efforts align well with Generac's workforce development goals for their project and, in many communities, present existing partnerships for Generac to connect with as they implement the proposed project.

MassCEC is very supportive of this effort to enhance grid flexibility alongside increased economic development opportunities for disadvantaged communities across Massachusetts.

Sincerely,

Jennifer Daloisio
Chief Executive Officer
Massachusetts Clean Energy Center

Project Title: Accelerating Building Thermal Electrification While Managing System Impacts
Project Manager: Michael Goldman

With the omnipresent threat of climate change, there is a growing focus on the need to reduce greenhouse gas emissions. One way in which this has manifested itself is through a push to replace fossil fuel heating systems and move towards the electrification of residential building thermal systems, primarily through the installation of electric heat pumps. While these systems no longer rely on fossil fuel, they do potentially present a strain on the electrical grid they are connected to and present the potential need for increased use of less efficient power plants to meet the increase in the demand.

To help mitigate this increased demand, Generac Grid Services (GGS) has partnered with Interstate Renewable Energy Council (IREC), Fraunhofer Center USA, the Massachusetts Clean Energy Center, Action for Boston Community Development (ABCD) as well as the Massachusetts electric utilities and energy efficiency Program Administrators – the Cape Light Compact, Unitil, Eversource Energy, and National Grid to demonstrate that it is possible to electrify the building thermal sector without causing system overloads, reliability issues, or needing infrastructure upgrades. This partnership will use funding from the Department of Energy and the Grid Resilience and Innovation Partnerships (GRIP) program to provide resources and opportunities to low and moderate income (LMI) customers in Environmental Justice Communities and other disadvantaged communities throughout the Commonwealth of Massachusetts, so that benefits can flow to these communities in line with the Justice40 Initiative.

The project will use the funding to install roughly 2,000 combined battery and heat pump systems, with additional smart thermostats and water heater control switches installed where appropriate, in LMI owner-occupied single-family homes. These distributed energy resources (DER) will be integrated into the Concerto™ Distributed Energy Resource Management System (DERMS) platform in order to control and dispatch them through Virtual Power Plants (VPP). The VPPs will allow the DERs to be called on to balance the demand and supply of the power system as needed, preventing or delaying the need for upgrades to the electric distribution network or bringing inefficient peaker plants online. There will also be a focus on the development and strengthening of the workforce associated with these equipment installations. The team will engage with low-income advocates and community action agencies to recruit participation from the target community.

This project will show that aggregating multiple different types of smart grid technologies together can provide tremendous value to both customers and the electric grid. The addition of batteries to the heat pumps will provide customers with additional resilience to their household. The grid will also see additional resilience by this addition of the fleet of controllable DERs that will be dispatched when there are constrains to the electric system. The VPPs can also be dispatched when inefficient power plants are running, helping lower emissions, and potentially reducing operational costs.

Instructions and Summary

Award Number: DE-FOA-0002740
Award Recipient: Generac Grid Services

Date of Submission: 3/13/2023
Form submitted by: Fraunhofer USA (Subrecipient)
(May be award recipient or sub-recipient)

Please read the instructions on each worksheet tab before starting. If you have any questions, please ask your DOE contact!
Do not modify this template or any cells for formulas!

1. If using this form for award application, negotiation, or budget revision, fill out the blank white cells in workbook tabs a. through j. with total project costs.
2. Blue colored cells contain instructions, headers, or summary calculations and should not be modified. Only blank white cells should be populated.
3. Enter detailed support for the project costs identified for each Category line item within each worksheet tab to autopopulate the summary tab.
4. The total budget presented on tabs a. through i. must include both Federal (DOE) and Non-Federal (cost share) portions.
5. All costs incurred by the preparer's sub-recipients, contractors, and Federal Research and Development Centers (FFRDCs), should be entered only in section f. Contractual. All other sections are for the costs of the preparer only.
6. Ensure all entered costs are allowable, allocable, and reasonable in accordance with the administrative requirements prescribed in 2 CFR 200, and the applicable cost principles for each entity type: FAR Part 31 for For-Profit entities; and 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.
7. Add rows as needed throughout tabs a. through j. If rows are added, formulas/calculations may need to be adjusted by the preparer. Do not add rows to the Instructions and Summary tab. If your project contains more than five budget periods, consult your DOE contact before adding additional budget period rows and columns.
8. ALL budget period cost categories are rounded to the nearest dollar.

BURDEN DISCLOSURE STATEMENT

Public reporting burden for this collection of information is estimated to average 24 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Office of Information Resources Management Policy, Plans, and Oversight, AD-241-2 - GTN, Paperwork Reduction Project (1910-5162), U.S. Department of Energy 1000 Independence Avenue, S.W., Washington, DC 20585; and to the Office of Management and Budget, Paperwork Reduction Project (1910-5162), Washington, DC 20503.

SUMMARY OF BUDGET CATEGORY COSTS PROPOSED

The values in this summary table are from entries made in subsequent tabs, only blank white cells require data entry

Section A - Budget Summary

	Federal	Cost Share			Total Costs	Cost Share %	Proposed Budget Period Dates
Budget Period 1	$529,097	$0			$529,097	0.00%	1/1/2024 - 12/31/2024
Budget Period 2	$359,424	$0			$359,424	0.00%	1/1/2025 - 12/31/2025
Budget Period 3	$268,646	$0			$268,646	0.00%	1/1/2026 - 12/31/2026
Budget Period 4	$232,090	$0			$232,090	0.00%	1/1/2027 - 12/31/2027
Budget Period 5	$661,228	$0			$661,228	0.00%	1/1/2028 - 12/31/2028
Total	$2,050,485	$0			$2,050,485	0.00%	

Section B - Budget Categories

CATEGORY	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	Total Costs	% of Project	**Comments** (as needed)
a. Personnel	$153,076	$103,544	$77,714	$66,144	$190,066	$590,545	28.80%	
b. Fringe Benefits	$91,846	$62,127	$46,628	$39,687	$114,039	$354,327	17.28%	
c. Travel	$66	$1,575	$66	$3,496	$4,361	$9,563	0.47%	
d. Equipment	$0	$0	$0	$0	$0	$0	0.00%	
e. Supplies	$0	$0	$0	$0	$0	$0	0.00%	
f. Contractual								
Sub-recipient	$0	$0	$0	$0	$0	$0	0.00%	
Contractor	$0	$0	$0	$0	$0	$0	0.00%	
FFRDC	$0	$0	$0	$0	$0	$0	0.00%	
Total Contractual	$0	$0	$0	$0	$0	$0	0.00%	
g. Construction	$0	$0	$0	$0	$0	$0	0.00%	
h. Other Direct Costs	$0	$0	$0	$0	$0	$0	0.00%	
Total Direct Costs	$244,988	$167,245	$124,408	$109,327	$308,466	$954,434	46.55%	
i. Indirect Charges	$284,110	$192,178	$144,237	$122,764	$352,762	$1,096,051	53.45%	
Total Costs	$529,097	$359,424	$268,646	$232,090	$661,228	$2,050,485	100.00%	

Additional Explanation (as needed):

a. Personnel

INSTRUCTIONS - PLEASE READ!!!
1. List project costs solely for employees of the entity completing this form. All personnel costs for subrecipients and contractors must be included under f. Contractual.
2. All personnel should be identified by position title and not employee name. Enter the amount of time (e.g., hours or % of time) and the base hourly rate and the total direct personnel compensation will automatically calculate. Rate basis (e.g., rate negotiated for each hour worked on the project, labor distribution report, state civil service rates, etc.) must also be identified.
3. If loaded labor rates are utilized, a description of the costs the loaded rate is comprised of must be included in the Additional Explanation section below. DOE must review all components of the loaded labor rate for reasonableness and unallowable costs (e.g. fee or profit).
4. If a position and hours are attributed to multiple employees (e.g. Technician working 4000 hours) the number of employees for that position title must be identified.
5. Each budget period is rounded to the nearest dollar.

SOPO Task #	Position Title	Budget Period 1			Budget Period 2			Budget Period 3			Budget Period 4			Budget Period 5			Project Total Hours	Project Total Dollars	Rate Basis
		Time (Hrs)	Hourly Rate ($/Hr)	Total Budget Period 1	Time (Hrs)	Hourly Rate ($/Hr)	Total Budget Period 2	Time (Hrs)	Hourly Rate ($/Hr)	Total Budget Period 3	Time (Hrs)	Hourly Rate ($/Hr)	Total Budget Period 4	Time (Hrs)	Hourly Rate ($/Hr)	Total Budget Period 5			
1	Sr. Engineer **(EXAMPLE!!!)**	2000	$85.00	$170,000	200	$50.00	$10,000	200	$50.00	$10,000	200	$50.00	$10,000	200	$50.00	$10,000	2400	$190,000	
2	Technicians (2)	4000	$20.00	$80,000	0	$0.00	$0	0	$0.00	$0	0	$0.00	$0	0	$0.00	$0	4000	$80,000	
				$0			$0			$0			$0			$0	0	$0	
1	Head, Building Energy Systems	80	$97.06	$7,765	80	$99.97	$7,997	80	$102.97	$8,237	80	$106.06	$8,485	60	$109.24	$6,554	380	$39,038	Actual Salary
	Head, Grid Integration	80	$81.71	$6,537	80	$84.16	$6,733	80	$86.69	$6,935	80	$89.29	$7,143	60	$91.97	$5,518	380	$32,865	Actual Salary
	Senior Engineer	26	$67.09	$1,744	26	$69.11	$1,797	26	$71.18	$1,851	26	$73.32	$1,906	26	$75.52	$1,963	130	$9,262	Actual Salary
	Project Engineer	26	$51.50	$1,339	26	$53.05	$1,379	26	$54.64	$1,421	26	$56.28	$1,463	26	$57.96	$1,507	130	$7,109	Actual Salary
6.1	Head, Building Energy Systems	40	$97.06	$3,882	0	$99.97	$0	0	$102.97	$0	0	$106.06	$0	0	$109.24	$0	40	$3,882	Actual Salary
	Head, Grid Integration	80	$81.71	$6,537	0	$84.16	$0	0	$86.69	$0	0	$89.29	$0	0	$91.97	$0	80	$6,537	Actual Salary
	Senior Engineer	160	$67.09	$10,735	0	$69.11	$0	0	$71.18	$0	0	$73.32	$0	0	$75.52	$0	160	$10,735	Actual Salary
	Project Engineer	160	$51.50	$8,240	0	$53.05	$0	0	$54.64	$0	0	$56.28	$0	0	$57.96	$0	160	$8,240	Actual Salary
6.2	Head, Building Energy Systems	20	$97.06	$1,941		$99.97	$0		$102.97	$0		$106.06	$0		$109.24	$0	20	$1,941	Actual Salary
	Head, Grid Integration	20	$81.71	$1,634		$84.16	$0		$86.69	$0		$89.29	$0		$91.97	$0	20	$1,634	Actual Salary
	Senior Engineer	120	$67.09	$8,051		$69.11	$0		$71.18	$0		$73.32	$0		$75.52	$0	120	$8,051	Actual Salary
	Project Engineer	40	$51.50	$2,060		$53.05	$0		$54.64	$0		$56.28	$0		$57.96	$0	40	$2,060	Actual Salary
6.3	Head, Building Energy Systems	20	$97.06	$1,941		$99.97	$0		$102.97	$0		$106.06	$0		$109.24	$0	20	$1,941	Actual Salary
	Head, Grid Integration	240	$81.71	$19,610		$84.16	$0		$86.69	$0		$89.29	$0		$91.97	$0	320	$19,610	Actual Salary
	Senior Engineer	80	$67.09	$5,368		$69.11	$0		$71.18	$0		$73.32	$0		$75.52	$0	80	$5,368	Actual Salary
	Project Engineer	480	$51.50	$24,720		$53.05	$0		$54.64	$0		$56.28	$0		$57.96	$0	480	$24,720	Actual Salary
6.4	Head, Building Energy Systems	20	$97.06	$1,941	20	$99.97	$1,999	20	$102.97	$2,059	20	$106.06	$2,121	20	$109.24	$2,185	100	$10,306	Actual Salary
	Head, Grid Integration	60	$81.71	$4,903	80	$84.16	$6,733	80	$86.69	$6,935	80	$89.29	$7,143	60	$91.97	$5,518	360	$31,231	Actual Salary
	Senior Engineer		$67.09	$0		$69.11	$0		$71.18	$0		$73.32	$0		$75.52	$0	0	$0	Actual Salary
	Project Engineer	160	$51.50	$8,240	200	$53.05	$10,609	200	$54.64	$10,927	200	$56.28	$11,255	160	$57.96	$9,274	920	$50,306	Actual Salary
6.5	Head, Building Energy Systems	80	$97.06	$7,765	40	$99.97	$3,999	40	$102.97	$4,119	20	$106.06	$2,121	20	$109.24	$2,185	200	$20,188	Actual Salary
	Head, Grid Integration	40	$81.71	$3,268	40	$84.16	$3,366	40	$86.69	$3,467	20	$89.29	$1,786	20	$91.97	$1,839	160	$13,727	Actual Salary
	Senior Engineer	160	$67.09	$10,735	80	$69.11	$5,529	40	$71.18	$2,847	20	$73.32	$1,466	20	$75.52	$1,510	320	$22,087	Actual Salary
	Project Engineer	80	$51.50	$4,120	80	$53.05	$4,244	40	$54.64	$2,185	20	$56.28	$1,126	20	$57.96	$1,159	240	$12,834	Actual Salary
6.6	Head, Building Energy Systems		$97.06	$0	80	$99.97	$7,997	40	$102.97	$4,119	0	$106.06	$0	80	$109.24	$8,739	200	$20,855	Actual Salary
	Head, Grid Integration		$81.71	$0	300	$84.16	$25,248	160	$86.69	$13,870	0	$89.29	$0	400	$91.97	$36,786	860	$75,904	Actual Salary
	Senior Engineer		$67.09	$0		$69.11	$0		$71.18	$0		$73.32	$0	80	$75.52	$6,041	200	$6,041	Actual Salary
	Project Engineer		$51.50	$0	300	$53.05	$15,914	160	$54.64	$8,742	0	$56.28	$0	400	$57.96	$23,185	860	$47,841	Actual Salary
6.7	Head, Building Energy Systems		$97.06	$0		$99.97	$0		$102.97	$0		$106.06	$0	40	$109.24	$4,370	40	$4,370	Actual Salary
	Head, Grid Integration		$81.71	$0		$84.16	$0		$86.69	$0		$89.29	$0	320	$91.97	$29,429	320	$29,429	Actual Salary
	Senior Engineer		$67.09	$0		$69.11	$0		$71.18	$0		$73.32	$0	40	$75.52	$3,021	40	$3,021	Actual Salary
	Project Engineer		$51.50	$0		$53.05	$0		$54.64	$0		$56.28	$0	320	$57.96	$18,548	320	$18,548	Actual Salary
6.8	Head, Building Energy Systems		$97.06	$0		$99.97	$0		$102.97	$0	80	$106.06	$8,485	80	$109.24	$8,739	160	$17,224	Actual Salary
	Head, Grid Integration		$81.71	$0		$84.16	$0		$86.69	$0	80	$89.29	$7,143	80	$91.97	$7,357	160	$14,500	Actual Salary
	Senior Engineer		$67.09	$0		$69.11	$0		$71.18	$0	0	$73.32	$0	0	$75.52	$0	0	$0	Actual Salary
	Project Engineer		$51.50	$0		$53.05	$0		$54.64	$0	80	$56.28	$4,502	80	$57.96	$4,637	160	$9,139	Actual Salary
				$0			$0			$0			$0			$0	0	$0	
	Total Personnel Costs	**2272**		**$153,076**	**1432**		**$103,544**	**1032**		**$77,714**	**832**		**$66,144**	**2412**		**$190,066**	**7980**	**$590,545**	

Additional Explanation (as needed):

Task

	1	2	3	4	5	Total
Head, Building Energy Systems	260	220	180	200	300	1160
Head, Grid Integration	520	500	360	260	940	2580
Senior Engineer	546	106	66	46	166	930
Project Engineer	946	606	426	326	1006	3310
	2,272	1,432	1,032	832	2,412	7,980

1 Project Management & Planning
2 Customer Education and Enrollment
3 Equipment Installation **Should include specs**
4 Asset Dispatch Control
5 Workforce Development
6 Measurement & Verification (M&V)
6.1 Develop M& Plan
6.2 Develop Data Acquisition and Data Collection Plan
6.3 Develop Data QC Screening Tool
6.4 Conducting Ongoing Data QC
6.5 Baseline Development
6.6 Conduct M&V
6.7 Conduct Scenario Analyses
6.8 Management & Reporting

b. Fringe Benefits

INSTRUCTIONS - PLEASE READ!!!
1. Fill out the table below by position title. If all employees receive the same fringe benefits, you can show "Total Personnel" in the Labor Type column instead of listing out all position titles.
2. The rates and how they are applied should not be averaged to get one fringe cost percentage. Complex calculations should be described/provided in the Additional Explanation section below.
3. The fringe benefit rates should be applied to all positions, regardless of whether those funds will be supported by Federal Share or Recipient Cost Share.
4. Each budget period is rounded to the nearest dollar.

Labor Type	Budget Period 1			Budget Period 2			Budget Period 3			Budget Period 4			Budget Period 5			Total Project
	Personnel Costs	Rate	Total	Personnel Costs	Rate	Total	Personnel Costs	Rate	Total	Personnel Costs	Rate	Total	Personnel Costs	Rate	Total	
EXAMPLE!!! Sr. Engineer	$170,000	20%	$34,000	$10,000	20%	$2,000	$10,000	20%	$2,000	$10,000	20%	$2,000	$10,000	20%	$2,000	$38,000
	153,076	60.00%	$91,846	103,544	60.00%	$62,127	77,714	60.00%	$46,628	66,144	60.00%	$39,687	190,066	60.00%	$114,039	$354,327
			$0			$0			$0			$0			$0	$0
			$0			$0			$0			$0			$0	$0
			$0			$0			$0			$0			$0	$0
			$0			$0			$0			$0			$0	$0
Total:	**$153,076**		**$91,846**	**$103,544**		**$62,127**	**$77,714**		**$46,628**	**$66,144**		**$39,687**	**$190,066**		**$114,039**	**$354,327**

A federally approved fringe benefit rate agreement, or a proposed rate supported and agreed upon by DOE for estimating purposes is required at the time of award negotiation if reimbursement for fringe benefits is requested. Please check (X) one of the options below and provide the requested information if not previously submitted.

___X__ A fringe benefit rate has been negotiated with, or approved by, a federal government agency. A copy of the latest rate agreement is/was included with the project application.*

_____ There is not a current federally approved rate agreement negotiated and available.**

*Unless the organization has submitted an indirect rate proposal which encompasses the fringe pool of costs, please provide the organization's benefit package and/or a list of the components/elements that comprise the fringe pool and the cost or percentage of each component/element allocated to the labor costs identified in the Budget Justification (Form EERE 335.1).

**When this option is checked, the entity preparing this form shall submit an indirect rate proposal in the format provided in the Sample Rate Proposal at https://www.energy.gov/eere/funding/downloads/sample-indirect-rate-proposal-and-profit-compliance-audit, or a format that provides the same level of information and which will support the rates being proposed for use in the performance of the proposed project.

Additional Explanation (as necessary): Please use this box (or an attachment) to list the elements that comprise your fringe benefits and how they are applied to your base (e.g. Personnel) to arrive at your fringe benefit rate.

c. Travel

INSTRUCTIONS - PLEASE READ!!!

1. Identify Foreign and Domestic Travel as separate items. Examples of Purpose of Travel are subrecipient site visits, DOE meetings, project mgmt. meetings, etc. Examples of Basis for Estimating Costs are past trips, travel quotes, GSA rates, etc.

2. All listed travel must be necessary for performance of the Statement of Project Objectives.

3. Only travel that is directly associated with this award should be included as a direct travel cost to the award.

4. Federal travel regulations are contained within the applicable cost principles for all entity types.

5. Travel costs should remain consistent with travel costs incurred by an organization during normal business operations as a result of the organizations written travel policy. In absence of a written travel policy, organizations must follow the regulations prescribed by the General Services Administration.

6. Columns E, F, G, H, I, J, and K are per trip.

7. The number of days is inclusive of the day of departure and the day of return.

8. Recipients should enter City and State (or City and Country for International travel) in the Depart from and Destination fields.

9. Each budget period is rounded to the nearest dollar.

SOPO Task #	Purpose of Travel	Depart From	Destination	No. of Days	No. of Travelers	Lodging per Traveler	Flight per Traveler	Vehicle per Traveler	Per Diem Per Traveler	Cost per Trip	Basis for Estimating Costs
	Domestic Travel	**Budget Period 1**									
1	**EXAMPLE!!!** Visit to PV manufacturer			2	2	$250	$500	$100	$160	$2,020	Current GSA rates
	Travel to deployment homes (Task 6)	Boston	Brockton	10	2	$0	$0	$33	$0	$66	$0.655/mile per IRS
										$0	
										$0	
										$0	
	International Travel										
										$0	
	Budget Period 1 Total									**$66**	
	Domestic Travel	**Budget Period 2**									
	Travel to deployment homes (Task 6)	Boston	Brockton	10	2	$0	$0	$33	$0	$66	$0.655/mile per IRS
	Travel to DOE Peer Review (Task 1)	Boston	Washington, DC	2	2	$256	$230	$150	$119	$1,509	Current GSA rates
										$0	
										$0	
	International Travel										
										$0	
	Budget Period 2 Total									**$1,575**	
	Domestic Travel	**Budget Period 3**									
	Travel to deployment homes (Task 6)	Boston	Brockton	10	2	$0	$0	$33	$0	$66	$0.655/mile per IRS
										$0	
										$0	
										$0	
	International Travel										
										$0	
	Budget Period 3 Total									**$66**	
	Domestic Travel	**Budget Period 4**									
	Travel to deployment homes (Task 6)	Boston	Brockton	10	2	$0	$0	$33	$0	$66	$0.655/mile per IRS
	Travel to Conference (Task 6.8)	Boston	San Francisco, CA	5	1	$1,080	$600	$300	$356	$3,431	Current GSA + Conference Registration = $1,095
										$0	
										$0	
	International Travel										
										$0	
	Budget Period 4 Total									**$3,496**	
	Domestic Travel	**Budget Period 5**									
	Travel to deployment homes (Task 6)	Boston	Brockton	10	2	$0	$0	$33	$0	$66	$0.655/mile per IRS
	Travel to Conference (Task 6.8)	Boston	Denver, CO	4	1	$597	$518	$300	$277	$2,787	Current GSA + Conference Registration = $1,095
	Travel to DOE Peer Review (Task 1)	Boston	Washington, DC	2	2	$256	$230	$150	$119	$1,509	Current GSA rates
										$0	
	International Travel										
										$0	
	Budget Period 5 Total									**$4,361**	
	PROJECT TOTAL									**$9,563**	

Additional Explanation (as needed):

d. Equipment

INSTRUCTIONS - PLEASE READ!!!

1. Equipment is generally defined as an item with an acquisition cost greater than $5,000 and a useful life expectancy of more than one year. Please refer to the applicable Federal regulations in 2 CFR 200 for specific equipment definitions and treatment.

2. List all equipment below, providing a basis of cost (e.g. contractor quotes, catalog prices, prior invoices, etc.). Briefly justify items as they apply to the Statement of Project Objectives. If it is existing equipment, provide logical support for the estimated value shown.

3. During award negotiations, provide a contractor quote for all equipment items over $50,000 in price. If the contractor quote is not an exact price match, provide an explanation in the additional explanation section below. If a contractor quote is not practical, such as for a piece of equipment that is purpose-built, first of its kind, or otherwise not available off the shelf, provide a detailed engineering estimate for how the cost estimate was derived.

4. Each budget period is rounded to the nearest dollar.

SOPO Task #	Equipment Item	Qty	Unit Cost	Total Cost	Basis of Cost	Justification of need
Budget Period 1						
3,4,5	**EXAMPLE!!!** Thermal shock chamber	2	$70,000	$140,000	Vendor Quote - Attached	Reliability testing of PV modules- Task 4.3
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 1 Total			$0		
Budget Period 2						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 2 Total			$0		
Budget Period 3						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 3 Total			$0		
Budget Period 4						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 4 Total			$0		
Budget Period 5						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 5 Total			$0		
	TOTAL EQUIPMENT			**$0**		

Additional Explanation (as needed):

e. Supplies

INSTRUCTIONS - PLEASE READ!!!

1. Supplies are generally defined as an item with an acquisition cost of $5,000 or less and a useful life expectancy of less than one year. Supplies are generally consumed during the project performance. Please refer to the applicable Federal regulations in 2 CFR 200 for specific supplies definitions and treatment.

2. List all proposed supplies below, providing a basis of costs (e.g. contractor quotes, catalog prices, prior invoices, etc.). Briefly justify the need for the Supplies as they apply to the Statement of Project Objectives. Note that Supply items must be direct costs to the project at this budget category, and not duplicative of supply costs included in the indirect pool that is the basis of the indirect rate applied for this project.

3. Multiple supply items valued at $5,000 or less used to assemble an equipment item with a value greater than $5,000 with a useful life of more than one year should be included on the equipment tab. If supply items and costs are ambiguous in nature, contact your DOE representative for proper categorization.

4. Add rows as needed. If rows are added, formulas/calculations may need to be adjusted by the preparer.

5. Each budget period is rounded to the nearest dollar.

SOPO Task #	General Category of Supplies	Qty	Unit Cost	Total Cost	Basis of Cost	Justification of need
Budget Period 1						
4,6	**EXAMPLE!!!** Wireless DAS components	10	$360.00	$3,600	Catalog price	For Alpha prototype - Task 2.4
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 1 Total			**$0**		
Budget Period 2						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 2 Total			$0		
Budget Period 3						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 3 Total			$0		
Budget Period 4						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 4 Total			$0		
Budget Period 5						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 5 Total			$0		
	TOTAL SUPPLIES			**$0**		

Additional Explanation (as needed):

f. Contractual

INSTRUCTIONS - PLEASE READ!!!

1. The entity completing this form must provide all costs related to sub-recipients, contractors, and FFRDC partners in the applicable boxes below.

2. Sub-recipients (partners, sub-awardees): Subrecipients shall submit a Budget Justification describing all project costs and calculations when their total proposed budget exceeds either (1) $100,000 or (2) 25% of total award costs. These sub-recipient forms may be completed by either the sub-recipients themselves or by the preparer of this form. The budget totals on the sub-recipient's forms must match the sub-recipient entries below. A subrecipient is a legal entity to which a subaward is made, who has performance measured against whether the objectives of the Federal program are met, is responsible for programmatic decision making, must adhere to applicable Federal program compliance requirements, and uses the Federal funds to carry out a program of the organization. All characteristics may not be present and judgment must be used to determine subrecipient vs. contractor status.

3. Contractors: List all contractors supplying commercial supplies or services used to support the project. For each Contractor cost with total project costs of $100,000 or more, a Contractor quote must be provided. A contractor is a legal entity contracted to provide goods and services within normal business operations, provides similar goods or services to many different purchasers, operates in a competitive environment, provides goods or services that are ancillary to the operation of the Federal program, and is not subject to compliance requirements of the Federal program. All characteristics may not be present and judgment must be used to determine subrecipient vs.contractor status.

4. Federal Funded Research and Development Centers (FFRDCs): FFRDCs must submit a signed Field Work Proposal during award application. The award recipient may allow the FFRDC to provide this information directly to DOE, however project costs must also be provided below.

5. Each budget period is rounded to the nearest dollar.

SOPO Task #	Sub-Recipient Name/Organization	Sub-Recipient Unique Entity Identifier (UEI)	Purpose and Basis of Cost	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	Project Total
2,4	**EXAMPLE!!!** XYZ Corp.		Partner to develop optimal lens for Gen 2 product. Cost estimate based on personnel hours.	$48,000	$32,000	$16,000			**$96,000**
									$0
									$0
									$0
									$0
									$0
									$0
			Sub-total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

SOPO Task #	Contractor Name/Organization	Purpose and Basis of Cost	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	Project Total
6	**EXAMPLE!!!** ABC Corp.	Contractor for developing robotics to perform lens inspection. Estimate provided by contractor.	$32,900	$86,500				**$119,400**
								$0
								$0
								$0
								$0
								$0
		Sub-total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

SOPO Task #	FFRDC Name/Organization	Purpose and Basis of Cost	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	Project Total
								$0
								$0
		Sub-total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Total Contractual	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Additional Explanation (as needed):

g. Construction

PLEASE READ!!!

1. Construction, for the purpose of budgeting, is defined as all types of work done on a particular building, including erecting, altering, or remodeling. Construction conducted by the award recipient is entered on this page. Any construction work that is performed by a contractor or subrecipient should be entered under f. Contractual.

2. List all proposed construction below, providing a basis of cost such as engineering estimates, prior construction, etc., and briefly justify its need as it applies to the Statement of Project Objectives.

3. Each budget period is rounded to the nearest dollar.

Overall description of construction activities: Example Only!!! - Build wind turbine platform

SOPO Task #	General Description	Cost	Basis of Cost	Justification of need
Budget Period 1				
3	EXAMPLE ONLY!!! Three days of excavation for platform site	$28,000	Engineering estimate	Site must be prepared for construction of platform.
	Budget Period 1 Total	$0		
Budget Period 2				
	Budget Period 2 Total	$0		
Budget Period 3				
	Budget Period 3 Total	$0		
Budget Period 4				
	Budget Period 4 Total	$0		
Budget Period 5				
	Budget Period 5 Total	$0		
	TOTAL CONSTRUCTION	**$0**		

Additional Explanation (as needed):

h. Other Direct Costs

INSTRUCTIONS - PLEASE READ!!!

1. Other direct costs are direct cost items required for the project which do not fit clearly into other categories. These direct costs must not be included in the indirect costs (for which the indirect rate is being applied for this project). Examples are: tuition, printing costs, etc. which can be directly charged to the project and are not duplicated in indirect costs (overhead costs).

2. Basis of cost are items such as vendor quotes, prior purchases of similar or like items, published price list, etc.

3. Each budget period is rounded to the nearest dollar.

SOPO Task #	General Description and SOPO Task #	Cost	Basis of Cost	Justification of need
	Budget Period 1			
5	**EXAMPLE!!!** Grad student tuition - tasks 1-3	$16,000	Established UCD costs	Support of graduate students working on project
	Budget Period 1 Total	$0		
	Budget Period 2			
	Budget Period 2 Total	$0		
	Budget Period 3			
	Budget Period 3 Total	$0		
	Budget Period 4			
	Budget Period 4 Total	$0		
	Budget Period 5			
	Budget Period 5 Total	$0		
	TOTAL OTHER DIRECT COSTS	**$0**		

Additional Explanation (as needed):

i. Indirect Costs

INSTRUCTIONS - PLEASE READ!!!
1. Fill out the table below to indicate how your indirect costs are calculated. Use the box below to provide additional explanation regarding your indirect rate calculation.
2. The rates and how they are applied should not be averaged to get one indirect cost percentage. Complex calculations or rates that do not do not correspond to the below categories should be described/provided in the Additional Explanation section below. If questions exist, consult with your DOE contact before filling out this section.
3. The indirect rate should be applied to both the Federal Share and Recipient Cost Share.
4. NOTE: A Recipient who elects to employ the 10% de minimis Indirect Cost rate **cannot claim resulting cost as a Cost Share contribution, nor can the Recipient claim "unrecovered indirect costs" as a Cost Share contribution**. Neither of these costs can be reflected as actual indirect cost rates realized by the orgnaization, and therefore are not verifiable in the Recipient records as required by Federal Regulation (200.306(b)(1))
5.. Each budget period is rounded to the nearest dollar.

	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	Total	Explanation of BASE
Provide ONLY Applicable Rates:							
Overhead Rate	116.00%	116.00%	116.00%	116.00%	116.00%		**Direct salaries and wages, plus fringe costs**
General & Administrative (G&A)	0.00%	0.00%	0.00%	0.00%	0.00%		
FCCM Rate, if applicable	0.00%	0.00%	0.00%	0.00%	0.00%		
OTHER Indirect Rate	0.00%	0.00%	0.00%	0.00%	0.00%		
Indirect Costs (As Applicable):							
Overhead Costs	$284,110	$192,178	$144,237	$122,764	$352,762	**$1,096,051**	
G&A Costs						**$0**	
FCCM Costs, if applicable						**$0**	
OTHER Indirect Costs						**$0**	
Total indirect costs requested:	**$284,110**	**$192,178**	**$144,237**	**$122,764**	**$352,762**	**$1,096,051**	

A federally approved indirect rate agreement, or rate proposed (supported and agreed upon by DOE for estimating purposes) is required if reimbursement of indirect costs is requested. Please check (X) one of the options below and provide the requested information if it has not already been provided as requested, or has changed.

___X__ An indirect rate has been approved or negotiated with a federal government agency. A copy of the latest rate agreement is included with this application and will be provided electronically to the Contracting Officer for this project.
_____ The organization does not have a current, federally approved indirect cost rate agreement and has provided an indirect rate proposal in support of the proposed costs.
_____ This organization has elected to apply a 10% de minimis rate in accordance with 2 CFR 200.414(f).

You must provide an explanation (below or in a separate attachment) and show how your indirect cost rate was applied to this budget in order to come up with the indirect costs shown.

Additional Explanation (as needed): *IMPORTANT: Please use this box (or an attachment) to further explain how your total indirect costs were calculated. If the total indirect costs are a cumulative amount of more than one calculation or rate application, the explanation and calculations should identify all rates used, along with the base they were applied to (and how the base was derived), and a total for each (along with grand total).

Cost Share

PLEASE READ!!!

1. A detailed presentation of the cash or cash value of all cost share proposed must be provided in the table below. All items in the chart below must be identified within the applicable cost category tabs a. through i. in addition to the detailed presentation of the cash or cash value of all cost share proposed provided in the table below. Identify the source organization & amount of each cost share item proposed in the award.

2. Cash Cost Share - encompasses all contributions to the project made by the recipient, subrecipient, or third party (an entity that does not have a role in performing the scope of work) for costs incurred and paid for during the project. This includes when an organization pays for personnel, supplies, equipment, etc. for their own company with organizational resources. If the item or service is reimbursed for, it is cash cost share. All cost share items must be necessary to the performance of the project. **Contractors may not provide cost share.** Any partial donation of goods or services is considered a discount and is not allowable.

3. In Kind Cost Share - encompasses all contributions to the project made by the recipient, subrecipient, or third party (an entity that does not have a role in performing the scope of work) where a value of the contribution can be readily determined, verified and justified but where no actual cash is transacted in securing the good or service comprising the contribution. In Kind cost share items include volunteer personnel hours, the donation of space or use of equipment, etc. The cash value and calculations thereof for all In Kind cost share items must be justified and explained in the Cost Share Item section below. All cost share items must be necessary to the performance of the project. If questions exist, consult your DOE contact before filling out In Kind cost share in this section. **Contractors may not provide cost share**. Any partial donation of goods or services is considered a discount and is not allowable.

4. Funds from other Federal sources MAY NOT be counted as cost share. This prohibition includes FFRDC sub-recipients. Non-Federal sources include any source not originally derived from Federal funds. Cost sharing commitment letters from subrecipients and third parties must be provided with the original application.

5. Fee or profit, including foregone fee or profit, **are not allowable** as project costs (including cost share) under any resulting award. The project may only incur those costs that are allowable and allocable to the project (including cost share) as determined in accordance with the applicable cost principles prescribed in FAR Part 31 for For-Profit entities and 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

6. NOTE: A Recipient who elects to employ the 10% de minimis Indirect Cost rate **cannot claim the resulting indirect costs as a Cost Share contribution.**

7. NOTE: A Recipient **cannot claim "unrecovered indirect costs"** as a Cost Share contribution, **without prior approval.**

8. Each budget period is rounded to the nearest dollar.

Organization/Source	Type (Cash or In Kind)	Cost Share Item	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	Total Project Cost Share
ABC Company **EXAMPLE!!!**	Cash	Project partner ABC Company will provide 20 PV modules for product development at the price of $680 per module	$13,600					**$13,600**
								$0
								$0
								$0
								$0
								$0
								$0
								$0
								$0
								$0
								$0
		TOTAL COST SHARE	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Total Project Cost: $2,050,485 **Cost Share Percent of Award: 0.0%**

Additional Explanation (as needed):

Applicant Name: Generac Grid Services Award Number: DE-FOA-0002740

Budget Information - Non Construction Programs

OMB Approval No. 0348-0044

Section A - Budget Summary

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget			
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)		Total (g)
1. Budget Period 1				$529,097	$0		$529,097
2. Budget Period 2				$359,424	$0		$359,424
3. Budget Period 3				$268,646	$0		$268,646
4. Budget Period 4				$232,090	$0		$232,090
5. Budget Period 5				$661,228	$0		$661,228
6. Totals				$2,050,485	$0		$2,050,485

Section B - Budget Categories

6. Object Class Categories	Grant Program, Function or Activity					Total (5)
	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	
a. Personnel	$153,076	$103,544	$77,714	$66,144	$190,066	$590,545
b. Fringe Benefits	$91,846	$62,127	$46,628	$39,687	$114,039	$354,327
c. Travel	$66	$1,575	$66	$3,496	$4,361	$9,563
d. Equipment	$0	$0	$0	$0	$0	$0
e. Supplies	$0	$0	$0	$0	$0	$0
f. Contractual	$0	$0	$0	$0	$0	$0
g. Construction	$0	$0	$0	$0	$0	$0
h. Other	$0	$0	$0	$0	$0	$0
i. Total Direct Charges (sum of 6a-6h)	$244,988	$167,245	$124,408	$109,327	$308,466	$954,434
j. Indirect Charges	$284,110	$192,178	$144,237	$122,764	$352,762	$1,096,051
k. **Totals** (sum of 6i-6j)	$529,097	$359,424	$268,646	$232,090	$661,228	$2,050,485
7. Program Income						$0

Department of Energy
Golden Field Office
15013 Denver West Parkway
Golden, Colorado 80401-3393

NEGOTIATED INDIRECT COST RATE AGREEMENT

September 18, 2020

Fraunhofer USA, Center for Manufacturing Innovations (CMI)
15 St. Mary's Street
Brookline, MA 02446

PREAMBLE

The purpose of this Agreement is to establish indirect cost rates for use in award and management of Federal contracts, grants, and other assistance arrangements to which Code of Federal Regulations (CFR) 2 CFR 200 applies. It consists of four parts: I -Rates and Bases; II - Particulars; III -Special Remarks; and IV - Approvals. This Agreement has been negotiated by the Department of Energy on behalf of the Federal Government pursuant to the authority cited in Appendix IV, of 2 CFR 200.

BILLING RATE: FRINGE

	EFFECTIVE PERIOD			ALLOCATION
TYPE	FROM	TO	RATE (%)	BASE *
FINAL	01/01/19	12/31/19	66.7%	(a)
PRED	01/01/20	12/31/24	60.0%	(a)

INDIRECT RATE: G & A

	EFFECTIVE PERIOD			ALLOCATION
TYPE	FROM	TO	RATE (%)	BASE *
FINAL	01/01/19	12/31/19	206.0%	(b)
PRED	01/01/20	12/31/24	116.0%	(b)

* BASIS FOR ALLOCATION:
(a) Total Labor Costs
(b) Total Direct Costs

TREATMENT OF FRINGE BENEFITS:

This organization uses a fringe benefit rate which is applied to direct & indirect salaries and wages (total labor dollars) for both budgeting and charging purposes for Federal projects. In addition to health, personnel insurances also including dental and life insurance, the directly claimed fringe benefits pool consist of payroll taxes, personnel insurances, workers compensation insurance, bonus, pension, university fringe, and paid leave which includes vacation, personal days, sick days, other days and holidays.

Instructions and Summary

Award Number: _____ **Date of Submission:** _____

Award Recipient: _____ **Form submitted by:** _____

(May be award recipient or sub-recipient)

Please read the instructions on each worksheet tab before starting. If you have any questions, please ask your DOE contact!
Do not modify this template or any cells for formulas!

1. If using this form for award application, negotiation, or budget revision, fill out the blank white cells in workbook tabs a. through j. with total project costs.
2. Blue colored cells contain instructions, headers, or summary calculations and should not be modified. Only blank white cells should be populated.
3. Enter detailed support for the project costs identified for each Category line item within each worksheet tab to autopopulate the summary tab.
4. The total budget presented on tabs a. through i. must include both Federal (DOE) and Non-Federal (cost share) portions.
5. All costs incurred by the preparer's sub-recipients, contractors, and Federal Research and Development Centers (FFRDCs), should be entered only in section f. Contractual. All other sections are for the costs of the preparer only.
6. Ensure all entered costs are allowable, allocable, and reasonable in accordance with the administrative requirements prescribed in 2 CFR 200, and the applicable cost principles for each entity type: FAR Part 31 for For-Profit entities; and 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.
7. Add rows as needed throughout tabs a. through j. If rows are added, formulas/calculations may need to be adjusted by the preparer. Do not add rows to the Instructions and Summary tab. If your project contains more than five budget periods, consult your DOE contact before adding additional budget period rows and columns.
8. ALL budget period cost categories are rounded to the nearest dollar.

BURDEN DISCLOSURE STATEMENT

Public reporting burden for this collection of information is estimated to average 24 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Office of Information Resources Management Policy, Plans, and Oversight, AD-241-2 - GTN, Paperwork Reduction Project (1910-5162), U.S. Department of Energy 1000 Independence Avenue, S.W., Washington, DC 20585; and to the Office of Management and Budget, Paperwork Reduction Project (1910-5162), Washington, DC 20503.

SUMMARY OF BUDGET CATEGORY COSTS PROPOSED

The values in this summary table are from entries made in subsequent tabs, only blank white cells require data entry

Section A - Budget Summary

	Federal	Cost Share			Total Costs	Cost Share %	Proposed Budget Period Dates
Budget Period 1	$321,165	$0			$321,165	0.00%	**Example!!!** 01/01/2014 - 12/31/2014
Budget Period 2	$329,194	$0			$329,194	0.00%	
Budget Period 3	$337,424	$0			$337,424	0.00%	
Budget Period 4	$345,860	$0			$345,860	0.00%	
Budget Period 5	$354,506	$0			$354,506	0.00%	
Total	$1,688,149	$0			$1,688,149	0.00%	

Section B - Budget Categories

CATEGORY	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	Total Costs	% of Project	**Comments** (as needed)
a. Personnel	$292,500	$299,813	$307,308	$314,991	$322,865	$1,537,476	91.07%	
b. Fringe Benefits	$0	$0	$0	$0	$0	$0	0.00%	
c. Travel	$0	$0	$0	$0	$0	$0	0.00%	
d. Equipment	$0	$0	$0	$0	$0	$0	0.00%	
e. Supplies	$0	$0	$0	$0	$0	$0	0.00%	
f. Contractual								
Sub-recipient	$0	$0	$0	$0	$0	$0	0.00%	
Contractor	$0	$0	$0	$0	$0	$0	0.00%	
FFRDC	$0	$0	$0	$0	$0	$0	0.00%	
Total Contractual	$0	$0	$0	$0	$0	$0	0.00%	
g. Construction	$0	$0	$0	$0	$0	$0	0.00%	
h. Other Direct Costs	$0	$0	$0	$0	$0	$0	0.00%	
Total Direct Costs	$292,500	$299,813	$307,308	$314,991	$322,865	$1,537,476	91.07%	
i. Indirect Charges	$28,665	$29,382	$30,116	$30,869	$31,641	$150,673	8.93%	
Total Costs	$321,165	$329,194	$337,424	$345,860	$354,506	$1,688,149	100.00%	

Additional Explanation (as needed):

a. Personnel

INSTRUCTIONS - PLEASE READ!!!

1. List project costs solely for employees of the entity completing this form. All personnel costs for subrecipients and contractors must be included under f. Contractual.

2. All personnel should be identified by position title and not employee name. Enter the amount of time (e.g., hours or % of time) and the base hourly rate and the total direct personnel compensation will automatically calculate. Rate basis (e.g., rate negotiated for each hour worked on the project, labor distribution report, state civil service rates, etc.) must also be identified.

3. If loaded labor rates are utilized, a description of the costs the loaded rate is comprised of must be included in the Additional Explanation section below. DOE must review all components of the loaded labor rate for reasonableness and unallowable costs (e.g. fee or profit).

4. If a position and hours are attributed to multiple employees (e.g. Technician working 4000 hours) the number of employees for that position title must be identified.

5. Each budget period is rounded to the nearest dollar.

SOPO Task #	Position Title	Budget Period 1			Budget Period 2			Budget Period 3			Budget Period 4			Budget Period 5			Project Total Hours	Project Total Dollars	Rate Basis
		Time (Hrs)	Hourly Rate ($/Hr)	Total Budget Period 1	Time (Hrs)	Hourly Rate ($/Hr)	Total Budget Period 2	Time (Hrs)	Hourly Rate ($/Hr)	Total Budget Period 3	Time (Hrs)	Hourly Rate ($/Hr)	Total Budget Period 4	Time (Hrs)	Hourly Rate ($/Hr)	Total Budget Period 5			
1	Sr. Engineer **(EXAMPLE!!!)**	2000	$85.00	$170,000	200	$50.00	$10,000	200	$50.00	$10,000	200	$50.00	$10,000	200	$50.00	$10,000	2400	$190,000	
2	Technicians (2)	4000	$20.00	$80,000	0	$0.00	$0	0	$0.00	$0	0	$0.00	$0	0	$0.00	$0	4000	$80,000	
2.2	Outreach Manager	1500	$50.00	$75,000	1500	$51.25	$76,875	1500	$52.53	$78,797	1500	$53.84	$80,767	1500	$55.19	$82,786	7500	$394,225	Acutal Salary
1	Project Management/Scoping	2000	$55.00	$110,000	2000	$56.38	$112,750	2000	$57.78	$115,569	2000	$59.23	$118,458	2000	$60.71	$121,419	10000	$578,196	Acutal Salary
3	Quality Control	1000	$55.00	$55,000	1000	$56.38	$56,375	1000	$57.78	$57,784	1000	$59.23	$59,229	1000	$60.71	$60,710	5000	$289,098	Acutal Salary
1	Program Management	250	$100.00	$25,000	250	$102.50	$25,625	250	$105.06	$26,266	250	$107.69	$26,922	250	$110.38	$27,595	1250	$131,408	Acutal Salary
1	Reporting / Payments	500	$55.00	$27,500	500	$56.38	$28,188	500	$57.78	$28,892	500	$59.23	$29,614	500	$60.71	$30,355	2500	$144,549	Acutal Salary
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
				$0			$0			$0			$0			$0	0	$0	
	Total Personnel Costs	**5250**		**$292,500**	**5250**		**$299,813**	**5250**		**$307,308**	**5250**		**$314,991**	**5250**		**$322,865**	**26250**	**$1,537,476**	

Additional Explanation (as needed):

b. Fringe Benefits

INSTRUCTIONS - PLEASE READ!!!
1. Fill out the table below by position title. If all employees receive the same fringe benefits, you can show "Total Personnel" in the Labor Type column instead of listing out all position titles.
2. The rates and how they are applied should not be averaged to get one fringe cost percentage. Complex calculations should be described/provided in the Additional Explanation section below.
3. The fringe benefit rates should be applied to all positions, regardless of whether those funds will be supported by Federal Share or Recipient Cost Share.
4. Each budget period is rounded to the nearest dollar.

Labor Type	Budget Period 1			Budget Period 2			Budget Period 3			Budget Period 4			Budget Period 5			Total Project
	Personnel Costs	Rate	Total	Personnel Costs	Rate	Total	Personnel Costs	Rate	Total	Personnel Costs	Rate	Total	Personnel Costs	Rate	Total	
EXAMPLE!!! Sr. Engineer	$170,000	20%	$34,000	$10,000	20%	$2,000	$10,000	20%	$2,000	$10,000	20%	$2,000	$10,000	20%	$2,000	$38,000
			$0			$0			$0			$0			$0	$0
			$0			$0			$0			$0			$0	$0
			$0			$0			$0			$0			$0	$0
			$0			$0			$0			$0			$0	$0
			$0			$0			$0			$0			$0	$0
Total:	**$0**		**$0**	**$0**		**$0**	**$0**		**$0**	**$0**		**$0**	**$0**		**$0**	**$0**

A federally approved fringe benefit rate agreement, or a proposed rate supported and agreed upon by DOE for estimating purposes is required at the time of award negotiation if reimbursement for fringe benefits is requested. Please check (X) one of the options below and provide the requested information if not previously submitted.

_____ A fringe benefit rate has been negotiated with, or approved by, a federal government agency. A copy of the latest rate agreement is/was included with the project application.*

_____ There is not a current federally approved rate agreement negotiated and available.**

*Unless the organization has submitted an indirect rate proposal which encompasses the fringe pool of costs, please provide the organization's benefit package and/or a list of the components/elements that comprise the fringe pool and the cost or percentage of each component/element allocated to the labor costs identified in the Budget Justification (Form EERE 335.1).

**When this option is checked, the entity preparing this form shall submit an indirect rate proposal in the format provided in the Sample Rate Proposal at https://www.energy.gov/eere/funding/downloads/sample-indirect-rate-proposal-and-profit-compliance-audit, or a format that provides the same level of information and which will support the rates being proposed for use in the performance of the proposed project.

Additional Explanation (as necessary): Please use this box (or an attachment) to list the elements that comprise your fringe benefits and how they are applied to your base (e.g. Personnel) to arrive at your fringe benefit rate.

c. Travel

INSTRUCTIONS - PLEASE READ!!!

1. Identify Foreign and Domestic Travel as separate items. Examples of Purpose of Travel are subrecipient site visits, DOE meetings, project mgmt. meetings, etc. Examples of Basis for Estimating Costs are past trips, travel quotes, GSA rates, etc.

2. All listed travel must be necessary for performance of the Statement of Project Objectives.

3. Only travel that is directly associated with this award should be included as a direct travel cost to the award.

4. Federal travel regulations are contained within the applicable cost principles for all entity types.

5. Travel costs should remain consistent with travel costs incurred by an organization during normal business operations as a result of the organizations written travel policy. In absence of a written travel policy, organizations must follow the regulations prescribed by the General Services Administration.

6. Columns E, F, G, H, I, J, and K are per trip.

7. The number of days is inclusive of the day of departure and the day of return.

8. Recipients should enter City and State (or City and Country for International travel) in the Depart from and Destination fields.

9. Each budget period is rounded to the nearest dollar.

SOPO Task #	Purpose of Travel	Depart From	Destination	No. of Days	No. of Travelers	Lodging per Traveler	Flight per Traveler	Vehicle per Traveler	Per Diem Per Traveler	Cost per Trip	Basis for Estimating Costs
	Domestic Travel	**Budget Period 1**									
1	**EXAMPLE!!!** Visit to PV manufacturer			2	2	$250	$500	$100	$160	$2,020	Current GSA rates
										$0	
										$0	
										$0	
										$0	
	International Travel										
										$0	
	Budget Period 1 Total									**$0**	
	Domestic Travel	**Budget Period 2**									
										$0	
										$0	
										$0	
										$0	
	International Travel										
										$0	
	Budget Period 2 Total									**$0**	
	Domestic Travel	**Budget Period 3**									
										$0	
										$0	
										$0	
										$0	
	International Travel										
										$0	
	Budget Period 3 Total									**$0**	
	Domestic Travel	**Budget Period 4**									
										$0	
										$0	
										$0	
										$0	
	International Travel										
										$0	
	Budget Period 4 Total									**$0**	
	Domestic Travel	**Budget Period 5**									
										$0	
										$0	
										$0	
										$0	
	International Travel										
										$0	
	Budget Period 5 Total									**$0**	
	PROJECT TOTAL									**$0**	

Additional Explanation (as needed):

d. Equipment

INSTRUCTIONS - PLEASE READ!!!

1. Equipment is generally defined as an item with an acquisition cost greater than $5,000 and a useful life expectancy of more than one year. Please refer to the applicable Federal regulations in 2 CFR 200 for specific equipment definitions and treatment.

2. List all equipment below, providing a basis of cost (e.g. contractor quotes, catalog prices, prior invoices, etc.). Briefly justify items as they apply to the Statement of Project Objectives. If it is existing equipment, provide logical support for the estimated value shown.

3. During award negotiations, provide a contractor quote for all equipment items over $50,000 in price. If the contractor quote is not an exact price match, provide an explanation in the additional explanation section below. If a contractor quote is not practical, such as for a piece of equipment that is purpose-built, first of its kind, or otherwise not available off the shelf, provide a detailed engineering estimate for how the cost estimate was derived.

4. Each budget period is rounded to the nearest dollar.

SOPO Task #	Equipment Item	Qty	Unit Cost	Total Cost	Basis of Cost	Justification of need
Budget Period 1						
3,4,5	**EXAMPLE!!!** Thermal shock chamber	2	$70,000	$140,000	Vendor Quote - Attached	Reliability testing of PV modules- Task 4.3
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 1 Total			$0		
Budget Period 2						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 2 Total			$0		
Budget Period 3						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 3 Total			$0		
Budget Period 4						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 4 Total			$0		
Budget Period 5						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 5 Total			$0		
	TOTAL EQUIPMENT			**$0**		

Additional Explanation (as needed):

e. Supplies

INSTRUCTIONS - PLEASE READ!!!

1. Supplies are generally defined as an item with an acquisition cost of $5,000 or less and a useful life expectancy of less than one year. Supplies are generally consumed during the project performance. Please refer to the applicable Federal regulations in 2 CFR 200 for specific supplies definitions and treatment.

2. List all proposed supplies below, providing a basis of costs (e.g. contractor quotes, catalog prices, prior invoices, etc.). Briefly justify the need for the Supplies as they apply to the Statement of Project Objectives. Note that Supply items must be direct costs to the project at this budget category, and not duplicative of supply costs included in the indirect pool that is the basis of the indirect rate applied for this project.

3. Multiple supply items valued at $5,000 or less used to assemble an equipment item with a value greater than $5,000 with a useful life of more than one year should be included on the equipment tab. If supply items and costs are ambiguous in nature, contact your DOE representative for proper categorization.

4. Add rows as needed. If rows are added, formulas/calculations may need to be adjusted by the preparer.

5. Each budget period is rounded to the nearest dollar.

SOPO Task #	General Category of Supplies	Qty	Unit Cost	Total Cost	Basis of Cost	Justification of need
Budget Period 1						
4,6	**EXAMPLE!!!** Wireless DAS components	10	$360.00	$3,600	Catalog price	For Alpha prototype - Task 2.4
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 1 Total			**$0**		
Budget Period 2						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 2 Total			$0		
Budget Period 3						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 3 Total			$0		
Budget Period 4						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 4 Total			$0		
Budget Period 5						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 5 Total			$0		
	TOTAL SUPPLIES			**$0**		

Additional Explanation (as needed):

f. Contractual

INSTRUCTIONS - PLEASE READ!!!

1. The entity completing this form must provide all costs related to sub-recipients, contractors, and FFRDC partners in the applicable boxes below.

2. Sub-recipients (partners, sub-awardees): Subrecipients shall submit a Budget Justification describing all project costs and calculations when their total proposed budget exceeds either (1) $100,000 or (2) 25% of total award costs. These sub-recipient forms may be completed by either the sub-recipients themselves or by the preparer of this form. The budget totals on the sub-recipient's forms must match the sub-recipient entries below. A subrecipient is a legal entity to which a subaward is made, who has performance measured against whether the objectives of the Federal program are met, is responsible for programmatic decision making, must adhere to applicable Federal program compliance requirements, and uses the Federal funds to carry out a program of the organization. All characteristics may not be present and judgment must be used to determine subrecipient vs. contractor status.

3. Contractors: List all contractors supplying commercial supplies or services used to support the project. For each Contractor cost with total project costs of $100,000 or more, a Contractor quote must be provided. A contractor is a legal entity contracted to provide goods and services within normal business operations, provides similar goods or services to many different purchasers, operates in a competitive environment, provides goods or services that are ancillary to the operation of the Federal program, and is not subject to compliance requirements of the Federal program. All characteristics may not be present and judgment must be used to determine subrecipient vs.contractor status.

4. Federal Funded Research and Development Centers (FFRDCs): FFRDCs must submit a signed Field Work Proposal during award application. The award recipient may allow the FFRDC to provide this information directly to DOE, however project costs must also be provided below.

5. Each budget period is rounded to the nearest dollar.

SOPO Task #	Sub-Recipient Name/Organization	Sub-Recipient Unique Entity Identifier (UEI)	Purpose and Basis of Cost	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	Project Total
2,4	**EXAMPLE!!!** XYZ Corp.		Partner to develop optimal lens for Gen 2 product. Cost estimate based on personnel hours.	$48,000	$32,000	$16,000			**$96,000**
									$0
									$0
									$0
									$0
									$0
									$0
			Sub-total	$0	$0	$0	$0	$0	$0

SOPO Task #	Contractor Name/Organization	Purpose and Basis of Cost	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	Project Total
6	**EXAMPLE!!!** ABC Corp.	Contractor for developing robotics to perform lens inspection. Estimate provided by contractor.	$32,900	$86,500				**$119,400**
								$0
								$0
								$0
								$0
								$0
		Sub-total	$0	$0	$0	$0	$0	$0

SOPO Task #	FFRDC Name/Organization	Purpose and Basis of Cost	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	Project Total
								$0
								$0
		Sub-total	$0	$0	$0	$0	$0	$0

	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	Project Total
Total Contractual	$0	$0	$0	$0	$0	$0

Additional Explanation (as needed):

g. Construction

PLEASE READ!!!

1. Construction, for the purpose of budgeting, is defined as all types of work done on a particular building, including erecting, altering, or remodeling. Construction conducted by the award recipient is entered on this page. Any construction work that is performed by a contractor or subrecipient should be entered under f. Contractual.

2. List all proposed construction below, providing a basis of cost such as engineering estimates, prior construction, etc., and briefly justify its need as it applies to the Statement of Project Objectives.

3. Each budget period is rounded to the nearest dollar.

Overall description of construction activities: Example Only!!! - Build wind turbine platform

SOPO Task #	General Description	Cost	Basis of Cost	Justification of need
Budget Period 1				
3	EXAMPLE ONLY!!! Three days of excavation for platform site	$28,000	Engineering estimate	Site must be prepared for construction of platform.
	Budget Period 1 Total	$0		
Budget Period 2				
	Budget Period 2 Total	$0		
Budget Period 3				
	Budget Period 3 Total	$0		
Budget Period 4				
	Budget Period 4 Total	$0		
Budget Period 5				
	Budget Period 5 Total	$0		
	TOTAL CONSTRUCTION	**$0**		

Additional Explanation (as needed):

h. Other Direct Costs

INSTRUCTIONS - PLEASE READ!!!

1. Other direct costs are direct cost items required for the project which do not fit clearly into other categories. These direct costs must not be included in the indirect costs (for which the indirect rate is being applied for this project). Examples are: tuition, printing costs, etc. which can be directly charged to the project and are not duplicated in indirect costs (overhead costs).

2. Basis of cost are items such as vendor quotes, prior purchases of similar or like items, published price list, etc.

3. Each budget period is rounded to the nearest dollar.

SOPO Task #	General Description and SOPO Task #	Cost	Basis of Cost	Justification of need
	Budget Period 1			
5	**EXAMPLE!!!** Grad student tuition - tasks 1-3	$16,000	Established UCD costs	Support of graduate students working on project
	Budget Period 1 Total	$0		
	Budget Period 2			
	Budget Period 2 Total	$0		
	Budget Period 3			
	Budget Period 3 Total	$0		
	Budget Period 4			
	Budget Period 4 Total	$0		
	Budget Period 5			
	Budget Period 5 Total	$0		
	TOTAL OTHER DIRECT COSTS	**$0**		

Additional Explanation (as needed):

i. Indirect Costs

INSTRUCTIONS - PLEASE READ!!!
1. Fill out the table below to indicate how your indirect costs are calculated. Use the box below to provide additional explanation regarding your indirect rate calculation.
2. The rates and how they are applied should not be averaged to get one indirect cost percentage. Complex calculations or rates that do not do not correspond to the below categories should be described/provided in the Additional Explanation section below. If questions exist, consult with your DOE contact before filling out this section.
3. The indirect rate should be applied to both the Federal Share and Recipient Cost Share.
4. NOTE: A Recipient who elects to employ the 10% de minimis Indirect Cost rate **cannot claim resulting cost as a Cost Share contribution, nor can the Recipient claim "unrecovered indirect costs" as a Cost Share contribution**. Neither of these costs can be reflected as actual indirect cost rates realized by the orgnaization, and therefore are not verifiable in the Recipient records as required by Federal Regulation (200.306(b)(1))
5.. Each budget period is rounded to the nearest dollar.

	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	Total	Explanation of BASE
Provide ONLY Applicable Rates:							
Overhead Rate	0.00%	0.00%	0.00%	0.00%	0.00%		*Example: Labor + Fringe*
General & Administrative (G&A)	0.00%	0.00%	0.00%	0.00%	0.00%		
FCCM Rate, if applicable	0.00%	0.00%	0.00%	0.00%	0.00%		
OTHER Indirect Rate	0.00%	0.00%	0.00%	0.00%	0.00%		
Indirect Costs (As Applicable):							
Overhead Costs	$28,665	$29,382	$30,116	$30,869		**$119,032**	
G&A Costs						**$0**	
FCCM Costs, if applicable						**$0**	
OTHER Indirect Costs						**$0**	
Total indirect costs requested:	**$28,665**	**$29,382**	**$30,116**	**$30,869**	**$31,641**	**$150,673**	

A federally approved indirect rate agreement, or rate proposed (supported and agreed upon by DOE for estimating purposes) is required if reimbursement of indirect costs is requested. Please check (X) one of the options below and provide the requested information if it has not already been provided as requested, or has changed.

_____ An indirect rate has been approved or negotiated with a federal government agency. A copy of the latest rate agreement is included with this application and will be provided electronically to the Contracting Officer for this project.
_____ The organization does not have a current, federally approved indirect cost rate agreement and has provided an indirect rate proposal in support of the proposed costs.
_____ This organization has elected to apply a 10% de minimis rate in accordance with 2 CFR 200.414(f).

You must provide an explanation (below or in a separate attachment) and show how your indirect cost rate was applied to this budget in order to come up with the indirect costs shown.

Additional Explanation (as needed): *IMPORTANT: Please use this box (or an attachment) to further explain how your total indirect costs were calculated. If the total indirect costs are a cumulative amount of more than one calculation or rate application, the explanation and calculations should identify all rates used, along with the base they were applied to (and how the base was derived), and a total for each (along with grand total).

Cost Share

PLEASE READ!!!

1. A detailed presentation of the cash or cash value of all cost share proposed must be provided in the table below. All items in the chart below must be identified within the applicable cost category tabs a. through i. in addition to the detailed presentation of the cash or cash value of all cost share proposed provided in the table below. Identify the source organization & amount of each cost share item proposed in the award.

2. Cash Cost Share - encompasses all contributions to the project made by the recipient, subrecipient, or third party (an entity that does not have a role in performing the scope of work) for costs incurred and paid for during the project. This includes when an organization pays for personnel, supplies, equipment, etc. for their own company with organizational resources. If the item or service is reimbursed for, it is cash cost share. All cost share items must be necessary to the performance of the project. **Contractors may not provide cost share.** Any partial donation of goods or services is considered a discount and is not allowable.

3. In Kind Cost Share - encompasses all contributions to the project made by the recipient, subrecipient, or third party (an entity that does not have a role in performing the scope of work) where a value of the contribution can be readily determined, verified and justified but where no actual cash is transacted in securing the good or service comprising the contribution. In Kind cost share items include volunteer personnel hours, the donation of space or use of equipment, etc. The cash value and calculations thereof for all In Kind cost share items must be justified and explained in the Cost Share Item section below. All cost share items must be necessary to the performance of the project. If questions exist, consult your DOE contact before filling out In Kind cost share in this section. **Contractors may not provide cost share**. Any partial donation of goods or services is considered a discount and is not allowable.

4. Funds from other Federal sources MAY NOT be counted as cost share. This prohibition includes FFRDC sub-recipients. Non-Federal sources include any source not originally derived from Federal funds. Cost sharing commitment letters from subrecipients and third parties must be provided with the original application.

5. Fee or profit, including foregone fee or profit, **are not allowable** as project costs (including cost share) under any resulting award. The project may only incur those costs that are allowable and allocable to the project (including cost share) as determined in accordance with the applicable cost principles prescribed in FAR Part 31 for For-Profit entities and 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

6. NOTE: A Recipient who elects to employ the 10% de minimis Indirect Cost rate **cannot claim the resulting indirect costs as a Cost Share contribution.**

7. NOTE: A Recipient **cannot claim "unrecovered indirect costs"** as a Cost Share contribution, **without prior approval.**

8. Each budget period is rounded to the nearest dollar.

Organization/Source	Type (Cash or In Kind)	Cost Share Item	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	Total Project Cost Share
ABC Company **EXAMPLE!!!**	Cash	Project partner ABC Company will provide 20 PV modules for product development at the price of $680 per module	$13,600					**$13,600**
								$0
								$0
								$0
								$0
								$0
								$0
								$0
								$0
								$0
								$0
		TOTAL COST SHARE	$0	$0	$0	$0	$0	$0

Total Project Cost: $1,688,149 **Cost Share Percent of Award: 0.0%**

Additional Explanation (as needed):

Applicant Name: 0 Award Number: 0

Budget Information - Non Construction Programs

OMB Approval No. 0348-0044

Section A - Budget Summary

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget			
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)		Total (g)
1. Budget Period 1				$321,165	$0		$321,165
2. Budget Period 2				$329,194	$0		$329,194
3. Budget Period 3				$337,424	$0		$337,424
4. Budget Period 4				$345,860	$0		$345,860
5. Budget Period 5				$354,506	$0		$354,506
6. Totals				$1,688,149	$0		$1,688,149

Section B - Budget Categories

6. Object Class Categories	Grant Program, Function or Activity					Total (5)
	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	
a. Personnel	$292,500	$299,813	$307,308	$314,991	$322,865	$1,537,476
b. Fringe Benefits	$0	$0	$0	$0	$0	$0
c. Travel	$0	$0	$0	$0	$0	$0
d. Equipment	$0	$0	$0	$0	$0	$0
e. Supplies	$0	$0	$0	$0	$0	$0
f. Contractual	$0	$0	$0	$0	$0	$0
g. Construction	$0	$0	$0	$0	$0	$0
h. Other	$0	$0	$0	$0	$0	$0
i. Total Direct Charges (sum of 6a-6h)	$292,500	$299,813	$307,308	$314,991	$322,865	$1,537,476
j. Indirect Charges	$28,665	$29,382	$30,116	$30,869	$31,641	$150,673
k. **Totals** (sum of 6i-6j)	$321,165	$329,194	$337,424	$345,860	$354,506	$1,688,149
7. Program Income						$0

Instructions and Summary

OMB Control Number: 1910-5162
Expiration Date: 10/31/2021

Award Number:
Award Recipient: Interstate Renewable Energy Council

Date of Submission:
Form submitted by: Interstate Renewable Energy Council
(May be award recipient or sub-recipient)

Please read the instructions on each worksheet tab before starting. If you have any questions, please ask your EERE contact!
Do not modify this template or any cells or formulas!

1. If using this form for award application, negotiation, or budget revision, fill out the blank white cells in workbook tabs a. through j. with total project costs. If using this form for invoice submission, fill out tabs a. through j. with total costs for just the proposed invoice and fill out tab k. per the instructions on that tab.
2. Blue colored cells contain instructions, headers, or summary calculations and should not be modified. Only blank white cells should be populated.
3. Enter detailed support for the project costs identified for each Category line item within each worksheet tab to autopopulate the summary tab.
4. The total budget presented on tabs a. through i. must include both Federal (DOE) and Non-Federal (cost share) portions.
5. All costs incurred by the preparer's sub-recipients, vendors, and Federal Research and Development Centers (FFRDCs), should be entered only in section f. Contractual. All other sections are for the costs of the preparer only.
6. Ensure all entered costs are allowable, allocable, and reasonable in accordance with the administrative requirements prescribed in 2 CFR 200, and the applicable cost principles for each entity type: FAR Part 31 for For-Profit entities; and 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.
7. Add rows as needed throughout tabs a. through j. If rows are added, formulas/calculations may need to be adjusted by the preparer. Do not add rows to the Instructions and Summary tab. If your project contains more than three budget periods, consult your EERE contact before adding additional budget period rows or columns.
8. ALL budget period cost categories are rounded to the nearest dollar.

BURDEN DISCLOSURE STATEMENT
Public reporting burden for this collection of information is estimated to average 3 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Office of Information Resources Management Policy, Plans, and Oversight, AD-241-2 - GTN, Paperwork Reduction Project (1910-5162), U.S. Department of Energy 1000 Independence Avenue, S.W., Washington, DC 20585; and to the Office of Management and Budget, Paperwork Reduction Project (1910-5162), Washington, DC 20503.

SUMMARY OF BUDGET CATEGORY COSTS PROPOSED

The values in this summary table are from entries made in subsequent tabs, only blank white cells require data entry

Section A - Budget Summary

	Federal	Cost Share	Cost Share	Cost Share	Total Costs	Cost Share %	Proposed Budget Period Dates
Budget Period 1	$93,762	$0	$0	$0	$93,762	0.00%	
Budget Period 2	$97,297	$0	$0	$0	$97,297	0.00%	
Budget Period 3	$89,250	$0	$0	$0	$89,250	0.00%	
Budget Period 4	$92,688	$0	$0	$0	$92,688	0.00%	
Budget Period 5	$106,657	$0	$0	$0	$106,657	0.00%	
Total	$479,654	$0	$0	$0	$479,654	0.00%	

Section B - Budget Categories

CATEGORY	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	Total Costs	% of Project	Comments (as needed)
a. Personnel	$42,880.00	$44,595.00	$41,720.00	$43,388.00	$50,164.00	$222,747	46.44%	
b. Fringe Benefits	$14,150.00	$14,716.00	$13,768.00	$14,318.00	$16,554.00	$73,506	15.32%	
c. Travel	$365	$365	$244	$244	$244	$1,462	0.30%	
d. Equipment	$0	$0	$0	$0	$0	$0	0.00%	
e. Supplies	$0	$0	$0	$0	$0	$0	0.00%	
f. Contractual						$0		
Sub-recipient	$0	$0	$0	$0	$0	$0	0.00%	
Vendor	$0	$0	$0	$0	$0	$0	0.00%	
FFRDC	$0	$0	$0	$0	$0	$0	0.00%	
Total Contractual	$0	$0	$0	$0	$0	$0	0.00%	
g. Construction	$0	$0	$0	$0	$0	$0	0.00%	
h. Other Direct Costs	$5,000	$5,000	$3,000	$3,000	$3,000	$19,000	3.96%	
Total Direct Costs	$62,395	$64,676	$58,732	$60,950	$69,962	$316,715	66.03%	
i. Indirect Charges	$31,367	$32,621	$30,518	$31,738	$36,695	$162,939.00	33.97%	
Total Costs	$93,762	$97,297	$89,250	$92,688	$106,657	$479,654.0	100.00%	

Additional Explanation (as needed):

a. Personnel

INSTRUCTIONS - PLEASE READ!!!

1. List project costs solely for employees of the entity completing this form. All personnel costs for subrecipients and vendors must be included under f. Contractual.

2. All personnel should be identified by position title and not employee name. Enter the amount of time (e.g., hours or % of time) and the base pay rate and the total direct personnel compensation will automatically calculate. Rate basis (e.g., actual salary, labor distribution report, state civil service rates, etc.) must also be identified.

3. If loaded labor rates are utilized, a description of the costs the loaded rate is comprised of must be included in the Additional Explanation section below. DOE must review all components of the loaded labor rate for reasonableness and unallowable costs (e.g. fee or profit).

4. If a position and hours are attributed to multiple employees (e.g. Technician working 4000 hours) the number of employees for that position title must be identified.

5. Each budget period is rounded to the nearest dollar.

SOPO Task #	Position Title	Budget Period 1			Budget Period 2			Budget Period 3			Budget Period 4			Budget Period 5			Project Total Hours	Project Total Dollars	Rate Basis
		Time	Pay	Total	Time	Pay	Total	Time	Pay	Total	Time	Pay	Total	Time	Pay	Total			
1	Sr. Engineer **(EXAMPLE!!!)**	2000	$85.00	$170,000	200	$50.00	$10,000	200	$50.00	$10,000	200	$50.00	$10,000	200	$50.00	$10,000	2400	$190,000	Actual Salary
2	Technicians (2)	4000	$20.00	$80,000	0	$0.00	$0	0	$0.00	$0	0	$0.00	$0	0	$0.00	$0	4000	$80,000	Actual Salary
	President & CEO	8	$130.00	$1,040	8	$135.20	$1,082	8	$140.61	$1,125	8	$146.23	$1,170	8	$152.08	$1,217	40	$5,632.98	
	Vice President	48	$75.00	$3,600	48	$78.00	$3,744	48	$81.12	$3,894	48	$84.36	$4,050	48	$87.74	$4,211	240	$15,449.25	
	Director III	160	$73.08	$11,693	160	$76.00	$12,161	120	$79.04	$9,485	120	$82.21	$9,865	160	$85.49	$13,679	440	$33,338.51	
	Director II	0	$62.98	$0	0	$65.50	$0	0	$68.12	$0	0	$70.84	$0	0	$73.68	$0	0	$0.00	
	Manager II	460	$45.67	$21,008	460	$47.50	$21,849	460	$49.40	$22,722	460	$51.37	$23,631	460	$53.43	$24,577	1380	$65,579.20	
	Manager I	160	$34.62	$5,539	160	$36.00	$5,761	120	$37.44	$4,493	120	$38.94	$4,673	160	$40.50	$6,480	440	$15,793.37	
				$0			$0			$0			$0			$0	0	$0.00	
				$0			$0			$0			$0			$0	0	$0.00	
				$0			$0			$0			$0			$0	0	$0.00	
				$0			$0			$0			$0			$0	0	$0.00	
				$0			$0			$0			$0			$0	0	$0.00	
				$0			$0			$0			$0			$0	0	$0.00	
				$0			$0			$0			$0			$0	0	$0.00	
				$0			$0			$0			$0			$0	0	$0.00	
				$0			$0			$0			$0			$0	0	$0.00	
				$0			$0			$0			$0			$0	0	$0.00	
				$0			$0			$0			$0			$0	0	$0.00	
				$0			$0			$0			$0			$0	0	$0.00	
				$0			$0			$0			$0			$0	0	$0.00	
				$0			$0			$0			$0			$0	0	$0.00	
	COLA increase per year>	4%		$0			$0			$0			$0			$0	0	$0.00	
	Total Personnel Costs	**836**		**$42,880**	**836**		**$44,595**	**756**		**$41,720**	**756**		**$43,388**	**836**		**$50,164**	**2428**	**$222,747.00**	

FTE yr 1	FTE yr 2	FTE yr 3	FTE yr 4	FTE yr 5
0.43%	0.43%	0.43%	0.43%	0.43%
2.61%	2.61%	2.61%	2.61%	2.61%
8.70%	8.70%	6.52%	6.52%	8.70%
0.00%	0.00%	0.00%	0.00%	0.00%
25.00%	25.00%	25.00%	25.00%	25.00%
8.70%	8.70%	6.52%	6.52%	8.70%
45.43%	**45.43%**	**41.09%**	**41.09%**	**45.43%**

Additional Explanation (as needed):

b. Fringe Benefits

INSTRUCTIONS - PLEASE READ!!!

1. Fill out the table below by position title. If all employees receive the same fringe benefits, you can show "Total Personnel" in the Labor Type column instead of listing out all position titles.
2. The rates and how they are applied should not be averaged to get one fringe cost percentage. Complex calculations should be described/provided in the Additional Explanation section below.
3. The fringe benefit rates should be applied to all positions, regardless of whether those funds will be supported by Federal Share or Recipient Cost Share.
4. Each budget period is rounded to the nearest dollar.

Labor Type	Budget Period 1			Budget Period 2			Budget Period 3			Budget Period 4			Budget Period 5			Total Project
	Personnel Costs	Rate	Total	Personnel Costs	Rate	Total	Personnel Costs	Rate	Total	Personnel Costs	Rate	Total	Personnel Costs	Rate	Total	
EXAMPLE!!! Sr. Engineer	$170,000	20%	$34,000	$10,000	20%	$2,000	$10,000	20%	$2,000	$10,000	20%	$2,000	$10,000	20%	$2,000	$38,000
Fringe	42,880	33.00%	$14,150	44,595	33.00%	$14,716	41,720	33.00%	$13,768	43,388	33.00%	$14,318	50,164	33.00%	######	$73,507
			$0			$0			$0			$0			$0	$0
			$0			$0			$0			$0			$0	$0
			$0			$0			$0			$0			$0	$0
			$0			$0			$0			$0			$0	$0
Total:	**$42,880**		**$14,150**	**$44,595**		**$14,716**	**$41,720**		**$13,768**	**$43,388**		**$14,318**	**$50,164**		**$16,554**	**$73,506**

A federally approved fringe benefit rate agreement, or a proposed rate supported and agreed upon by DOE for estimating purposes is required at the time of award negotiation if reimbursement for fringe benefits is requested. Please check (X) one of the options below and provide the requested information if not previously submitted.

___X___ A fringe benefit rate has been negotiated with, or approved by, a federal government agency. A copy of the latest rate agreement is/was included with the project application.*

_____ There is not a current federally approved rate agreement negotiated and available.**

*Unless the organization has submitted an indirect rate proposal which encompasses the fringe pool of costs, please provide the organization's benefit package and/or a list of the components/elements that comprise the fringe pool and the cost or percentage of each component/element allocated to the labor costs identified in the Budget Justification (Form EERE 335).

**When this option is checked, the entity preparing this form shall submit an indirect rate proposal in the format provided in the Sample Rate Proposal at https://www.energy.gov/eere/funding/downloads/sample-indirect-rate-proposal-and-profit-compliance-audit, or a format that provides the same level of information and which will support the rates being proposed for use in the performance of the proposed project.

Additional Explanation (as necessary): Please use this box (or an attachment) to list the elements that comprise your fringe benefits and how they are applied to your base (e.g. Personnel) to arrive at your fringe benefit rate.

c. Travel

INSTRUCTIONS - PLEASE READ!!!

1. Identify Foreign and Domestic Travel as separate items. Examples of Purpose of Travel are subrecipient site visits, DOE meetings, project mgmt. meetings, etc. Examples of Basis for Estimating Costs are past trips, travel quotes, GSA rates, etc.
2. All listed travel must be necessary for performance of the Statement of Project Objectives.
3. Only travel that is directly associated with this award should be included as a direct travel cost to the award.
4. Federal travel regulations are contained within the applicable cost principles for all entity types.
5. Travel costs should remain consistent with travel costs incurred by an organization during normal business operations as a result of the organizations written travel policy. In absence of a written travel policy, organizations must follow the regulations prescribed by the General Services Administration.
6. Columns E, F, G, H, I, J, and K are per trip.
7. The number of days is inclusive of day of departure and day of return.
8. Recipients should enter City and State (or City and Country for International travel) in the Depart from and Destination fields.
9. Each budget period is rounded to the nearest dollar.

SOPO Task #	Purpose of Travel	Depart From	Destination	No. of Days	No. of Travelers	Lodging per Traveler	Flight per Traveler	Vehicle per Traveler	Per Diem Per Traveler	Cost per Trip	Basis for Estimating Costs
	Domestic Travel	**Budget Period 1**									
1	**EXAMPLE!!!** Visit to PV manufacturer			2	2	$250	$500	$100	$160	$2,020	Current GSA rates
	Travel within MA for stakeholder engagement	MA	MA	1	1			$63	$59	$122	Current GSA M&IE rates, current
	Travel within MA for stakeholder engagement	MA	MA	1	1			$63	$59	$122	Current GSA M&IE rates, current
	Travel within MA for stakeholder engagement	MA	MA	1	1			$63	$59	$122	Current GSA M&IE rates, current
	International Travel										
										$0	
	Budget Period 1 Total									**$365**	
	Domestic Travel	**Budget Period 2**									
	Travel within MA for stakeholder engagement	MA	MA	1	1			$63	$59	$122	Current GSA M&IE rates, current
	Travel within MA for stakeholder engagement	MA	MA	1	1			$63	$59	$122	Current GSA M&IE rates, current
	Travel within MA for stakeholder engagement	MA	MA	1	1			$63	$59	$122	Current GSA M&IE rates, current
	International Travel										
										$0	
	Budget Period 2 Total									**$365**	
	Domestic Travel	**Budget Period 3**									
	Travel within MA for stakeholder engagement	MA	MA	1	1			$63	$59	$122	Current GSA M&IE rates, current
	Travel within MA for stakeholder engagement	MA	MA	1	1			$63	$59	$122	Current GSA M&IE rates, current
										$0	
	International Travel										
										$0	
	Budget Period 3 Total									**$244**	
	Domestic Travel	**Budget Period 4**									
	Travel within MA for stakeholder engagement	MA	MA	1	1			$63	$59	$122	Current GSA M&IE rates, current
	Travel within MA for stakeholder engagement	MA	MA	1	1			$63	$59	$122	Current GSA M&IE rates, current
										$0	
	International Travel										
										$0	
	Budget Period 4 Total									**$244**	
	Domestic Travel	**Budget Period 5**									
	Travel within MA for stakeholder engagement	MA	MA	1	1			$63	$59	$122	Current GSA M&IE rates, current
	Travel within MA for stakeholder engagement	MA	MA	1	1			$63	$59	$122	Current GSA M&IE rates, current
										$0	
	International Travel										
										$0	
	Budget Period 5 Total									**$244**	
	PROJECT TOTAL									**$1,462**	

Additional Explanation (as needed):

d. Equipment

INSTRUCTIONS - PLEASE READ!!!

1. Equipment means tangible personal property (including information technology systems) having a useful life of more than one year and a per-unit acquisition cost which equals or exceeds the lesser of the capitalization level established by the non-Federal entity for financial statement purposes, or $5,000. Please refer to the applicable Federal regulations in 2 CFR 200 for specific equipment definitions and treatment.

2. List all equipment below, providing a basis of cost (e.g. vendor quotes, catalog prices, prior invoices, etc.). Briefly justify items as they apply to the Statement of Project Objectives. If it is existing equipment, provide logical support for the estimated value shown.

3. During award negotiations, provide a vendor quote for all equipment items over $50,000 in price. If the vendor quote is not an exact price match, provide an explanation in the additional explanation section below. If a vendor quote is not practical, such as for a piece of equipment that is purpose-built, first of its kind, or otherwise not available off the shelf, provide a detailed engineering estimate for how the cost estimate was derived.

4. Each budget period is rounded to the nearest dollar.

SOPO	Equipment Item	Qty	Unit Cost	Total Cost	Basis of Cost	Justification of need
Budget Period 1						
3,4,5	**EXAMPLE!!!** Thermal shock chamber	2	$70,000	$140,000	Vendor Quote - Attached	Reliability testing of PV modules- Task 4.3
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 1 Total			$0		
Budget Period 2						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 2 Total			$0		
Budget Period 3						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 3 Total			$0		
	PROJECT TOTAL			**$0**		

Additional Explanation (as needed):

e. Supplies

INSTRUCTIONS - PLEASE READ!!!

1. Supplies are generally defined as an item with an acquisition cost of $5,000 or less and a useful life expectancy of less than one year. Supplies are generally consumed during the project performance. Please refer to the applicable Federal regulations in 2 CFR 200 for specific supplies definitions and treatment. A computing device is a supply if the acquisition cost is less than the lesser of the capitalization level established by the non-Federal entity for financial statement purposes or $5,000, regardless of the length of its useful life.

2. List all proposed supplies below, providing a basis of costs (e.g. vendor quotes, catalog prices, prior invoices, etc.). Briefly justify the need for the Supplies as they apply to the Statement of Project Objectives. Note that Supply items must be direct costs to the project at this budget category, and not duplicative of supply costs included in the indirect pool that is the basis of the indirect rate applied for this project.

3. Multiple supply items valued at $5,000 or less used to assemble an equipment item with a value greater than $5,000 with a useful life of more than one year should be included on the equipment tab. If supply items and costs are ambiguous in nature, contact your DOE representative for proper categorization.

4. Add rows as needed. If rows are added, formulas/calculations may need to be adjusted by the preparer.

5. Each budget period is rounded to the nearest dollar.

SOPO	General Category of Supplies	Qty	Unit Cost	Total Cost	Basis of Cost	Justification of need
Budget Period 1						
4,6	**EXAMPLE!!!** Wireless DAS components	10	$360.00	$3,600	Catalog price	For Alpha prototype - Task 2.4
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 1 Total			**$0**		
Budget Period 2						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 2 Total			$0		
Budget Period 3						
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
				$0		
	Budget Period 3 Total			$0		
	PROJECT TOTAL			**$0**		

Additional Explanation (as needed):

f. Contractual

INSTRUCTIONS - PLEASE READ!!!

1. The entity completing this form must provide all costs related to subrecipients, vendors, and FFRDC partners in the applicable boxes below.

2. Subrecipients (partners, sub-awardees): Subrecipients shall submit a Budget Justification describing all project costs and calculations when their total proposed budget exceeds either (1) $250,000 or (2) 25% of total award costs. These subrecipient forms may be completed by either the subrecipients themselves or by the preparer of this form. The budget totals on the subrecipient's forms must match the subrecipient entries below. A subrecipient is a legal entity to which a subaward is made, who has performance measured against whether the objectives of the Federal program are met, is responsible for programmatic decision making, must adhere to applicable Federal program compliance requirements, and uses the Federal funds to carry out a program of the organization. All characteristics may not be present and judgment must be used to determine subrecipient vs. vendor status.

3. Vendors (including contractors): List all vendors and contractors supplying commercial supplies or services used to support the project. For each Vendor cost with total project costs of $250,000 or more, a Vendor quote must be provided. A vendor is a legal entity contracted to provide goods and services within normal business operations, provides similar goods or services to many different purchasers, operates in a competitive environment, provides goods or services that are ancillary to the operation of the Federal program, and is not subject to compliance requirements of the Federal program. All characteristics may not be present and judgment must be used to determine subrecipient vs. vendor status.

4. Federal Funded Research and Development Centers (FFRDCs): FFRDCs must submit a signed Field Work Proposal during award application. The award recipient may allow the FFRDC to provide this information directly to DOE, however project costs must also be provided below.

5. Each budget period is rounded to the nearest dollar.

SOPO	Sub-Recipient	Purpose and Basis of Cost	Budget	Budget	Budget	Project
2,4	**EXAMPLE!!!** XYZ Corp.	Partner to develop optimal lens for Gen 2 product. Cost estimate based on personnel hours.	$48,000	$32,000	$16,000	**$96,000**
						$0
						$0
						$0
						$0
						$0
						$0
						$0
						$0
		Sub-total	$0	$0	$0	$0

SOPO Task #	Vendor Name/Organization	Purpose and Basis of Cost	Budget Period 1	Budget Period 2	Budget Period 3	Project Total
6	**EXAMPLE!!!** ABC Corp.	Vendor for developing robotics to perform lens inspection. Estimate	$32,900	$86,500		**$119,400**
						$0
						$0
						$0
						$0
						$0
		Sub-total	$0	$0	$0	$0

SOPO	FFRDC	Purpose and Basis of Cost	Budget	Budget	Budget	Project
						$0
						$0
		Sub-total	$0	$0	$0	$0

	Total Contractual		$0	$0	$0	$0

Additional Explanation (as needed):

g. Construction

PLEASE READ!!!

1. Construction, for the purpose of budgeting, is defined as all types of work done on a particular building, including erecting, altering, or remodeling. Construction conducted by the award recipient is entered on this page. Any construction work that is performed by a vendor or subrecipient should be entered under f. Contractual.

2. List all proposed construction below, providing a basis of cost such as engineering estimates, prior construction, etc., and briefly justify its need as it applies to the Statement of Project Objectives.

3. Each budget period is rounded to the nearest dollar.

Overall description of construction activities: Example Only!!! - Build wind turbine platform

SOPO	General Description	Cost	Basis of Cost	Justification of need
Budget Period 1				
3	EXAMPLE ONLY!!! Three days of excavation for platform site	$28,000	Engineering estimate	Site must be prepared for construction of platform.
	Budget Period 1 Total	**$0**		
Budget Period 2				
	Budget Period 2 Total	$0		
Budget Period 3				
	Budget Period 3 Total	$0		
	PROJECT TOTAL	**$0**		

Additional Explanation (as needed):

h. Other Direct Costs

INSTRUCTIONS - PLEASE READ!!!
1. Other direct costs are direct cost items required for the project which do not fit clearly into other categories. These direct costs must not be included in the indirect costs (for which the indirect rate is being applied for this project). Examples are: tuition, printing costs, etc. which can be directly charged to the project and are not duplicated in indirect costs (overhead costs).
2. Basis of cost are items such as vendor quotes, prior purchases of similar or like items, published price list, etc.
3. Each budget period is rounded to the nearest dollar.

SOPO	General Description and SOPO Task #	Cost	Basis of Cost	Justification of need
	Budget Period 1			
5	**EXAMPLE!!!** Grad student tuition - tasks 1-3	$16,000	Established UCD costs	Support of graduate students working on project
	Outreach costs	$5,000	Based on historical costs	Costs for press releases, community events, program communications, materials for distribution, etc.
	Budget Period 1 Total	$5,000		
	Budget Period 2			
	Outreach costs	$5,000	Based on historical costs	Costs for press releases, community events, program communications, materials for distribution, etc.
	Budget Period 2 Total	$5,000		
	Budget Period 3			
	Outreach costs	$3,000	Based on historical costs	Costs for press releases, community events, program communications, materials for distribution, etc.
	Budget Period 3 Total	$3,000		
	Budget Period 4			
	Outreach costs	$3,000	Based on historical costs	Costs for press releases, community events, program communications, materials for distribution, etc.
	Budget Period 4 Total	$3,000		
	Budget Period 5			
	Outreach costs	$3,000	Based on historical costs	Costs for press releases, community events, program communications, materials for distribution, etc.
	Budget Period 5 Total	$3,000		
	PROJECT TOTAL	**$19,000**		

Additional Explanation (as needed):

i. Indirect Costs

INSTRUCTIONS - PLEASE READ!!!

1. Fill out the table below to indicate how your indirect costs are calculated. Use the box below to provide additional explanation regarding your indirect rate calculation.

2. The rates and how they are applied should not be averaged to get one indirect cost percentage. Complex calculations or rates that do not do not correspond to the below categories should be described/provided in the Additional Explanation section below. If questions exist, consult with your DOE contact before filling out this section.

3. The indirect rate should be applied to both the Federal Share and Recipient Cost Share.

4. NOTE: A Recipient who elects to employ the 10% de minimis Indirect Cost rate **cannot claim resulting costs as a Cost Share contribution, nor can the Recipient claim "unrecovered indirect costs" as a Cost Share contribution.** Neither of these costs can be reflected as actual indirect cost rates realized by the organization, and therefore are not verifiable in the Recipient records as required by Federal Regulation (§200.306(b)(1)).

5. Each budget period is rounded to the nearest dollar.

	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 3	Budget Period 3	Total	Explanation of BASE
Provide ONLY Applicable Rates:							
Overhead Rate	0.00%	0.00%	0.00%	0.00%	0.00%		
General & Administrative (G&A)	55.00%	55.00%	55.00%	55.00%	55.00%		**Personnel + Fringe**
FCCM Rate, if applicable	0.00%	0.00%	0.00%	0.00%	0.00%		
OTHER Indirect Rate	0.00%	0.00%	0.00%	0.00%	0.00%		
Indirect Costs (As Applicable):							
Overhead Costs						**$0**	
G&A Costs	$31,367	$32,621	$30,518	$31,738	$36,695	**$162,939**	**Personnel + Fringe**
FCCM Costs, if applicable						**$0**	
OTHER Indirect Costs						**$0**	
Total indirect costs requested:	**$31,367**	**$32,621**	**$30,518**	**$31,738**	**$36,695**	**$162,939**	

A federally approved indirect rate agreement, or rate proposed (supported and agreed upon by DOE for estimating purposes) is required if reimbursement of indirect costs is requested. Please check (X) one of the options below and provide the requested information if it has not already been provided as requested, or has changed.

_X__ An indirect rate has been approved or negotiated with a federal government agency. A copy of the latest rate agreement is included with this application, and will be provided electronically to the Contracting Officer for this project.

_____ There is not a current, federally approved rate agreement negotiated and available*.

***When this option is checked, the entity preparing this form shall submit an indirect rate proposal in the format provided by your DOE contact, or a format that provides the same level of information and which will support the rates being proposed for use in performance of the proposed project. Additionally, any non-Federal entity that has never received a negotiated indirect cost rate, except for those non-Federal entities described in Appendix VII to Part 200—States and Local Government and Indian Tribe Indirect Cost Proposals, paragraph D.1.b, may elect to charge a de minimis rate of 10% of modified total direct costs (MTDC) which may be used indefinitely.As described in §200.403 Factors affecting allowability of costs, costs must be consistently charged as either indirect or direct costs, but may not be double charged or inconsistently charged as both. If chosen, this methodology once elected must be used consistently for all Federal awards until such time as a non-Federal entity chooses to negotiate for a rate, which the non-Federal entity may apply to do at any time.**

You must provide an explanation (below or in a separate attachment) and show how your indirect cost rate was applied to this budget in order to come up with the indirect costs shown.

Additional Explanation (as needed): *IMPORTANT: Please use this box (or an attachment) to further explain how your total indirect costs were calculated. If the total indirect costs are a cumulative amount of more than one calculation or rate application, the explanation and calculations should identify all rates used, along with the base they were applied to (and how the base was derived), and a total for each (along with grand total).

Cost Share

PLEASE READ!!!

1. A detailed presentation of the cash or cash value of all cost share proposed must be provided in the table below. All items in the chart below must be identified within the applicable cost category tabs a. through i. in addition to the detailed presentation of the cash or cash value of all cost share proposed provided in the table below. Identify the source organization & amount of each cost share item proposed in the award.

2. Cash Cost Share - encompasses all contributions to the project made by the recipient, subrecipient, or third party (an entity that does not have a role in performing the scope of work) for costs incurred and paid for during the project. This includes when an organization pays for personnel, supplies, equipment, etc. for their own company with organizational resources. If the item or service is reimbursed for, it is cash cost share. All cost share items must be necessary to the performance of the project. **Vendors may not provide cost share.** Any partial donation of goods or services is considered a discount and is not allowable.

3. In Kind Cost Share - encompasses all contributions to the project made by the recipient, subrecipient, or third party (an entity that does not have a role in performing the scope of work) where a value of the contribution can be readily determined, verified and justified but where no actual cash is transacted in securing the good or service comprising the contribution. In Kind cost share items include volunteer personnel hours, the donation of space or use of equipment, etc. The cash value and calculations thereof for all In Kind cost share items must be justified and explained in the Cost Share Item section below. All cost share items must be necessary to the performance of the project. If questions exist, consult your DOE contact before filling out In Kind cost share in this section. Vendors may not provide cost share. Any partial donation of goods or services is considered a discount and is not allowable.

4. Funds from other Federal sources MAY NOT be counted as cost share. This prohibition includes FFRDC sub-recipients. Non-Federal sources include any source not originally derived from Federal funds. Cost sharing commitment letters from subrecipients and third parties must be provided with the original application.

5. Fee or profit, including foregone fee or profit, **are not allowable** as project costs (including cost share) under any resulting award. The project may only incur those costs that are allowable and allocable to the project (including cost share) as determined in accordance with the applicable cost principles prescribed in FAR Part 31 for For-Profit entities and 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

6. NOTE: A Recipient who elects to employ the 10% de minimis Indirect Cost rate **cannot claim the resulting indirect costs as a Cost Share contribution.**

7. **NOTE:** A Recipient **cannot claim "unrecovered indirect costs"** as a Cost Share contribution, **without prior approval.**

8. Each budget period is rounded to the nearest dollar.

Organization/Source	Type (Cash or In Kind)	Cost Share Item	Budget Period 1	Budget Period 2	Budget Period 3	Total Project Cost Share
ABC Company	Cash	Project partner ABC Company will provide 20 PV modules for product	$13,600			$13,600
						$0
						$0
						$0
						$0
						$0
						$0
						$0
						$0
						$0
						$0
		Totals	$0	$0	$0	$0
		Cost Share Percentage per Budget Period	0.0%	0.0%	0.0%	

Total Proiect Cost: $479.654 **Total Proiect Cost Share Percent: 0.0%**

Additional Explanation (as needed):

Applicant Name: Interstate Renewable Energy Council Award Number: 0

Budget Information - Non Construction Programs

OMB Approval No. 0348-0044

Section A - Budget Summary

Grant Program Function or Activity	Catalog of Federal Domestic Assistance Number	Estimated Unobligated Funds		New or Revised Budget		
		Federal	Non-Federal	Federal	Non-Federal	Total
(a)	(b)	(c)	(d)	(e)	(f)	(g)
1. Budget Period 1				$93,762.00	$0.00	$93,762.00
2. Budget Period 2				$97,297.00	$0.00	$97,297.00
3. Budget Period 3				$89,250.00	$0.00	$89,250.00
4.						
5. Totals				$280,309.00	$0.00	$280,309.00

Section B - Budget Categories

6. Object Class Categories	Grant Program, Function or Activity				Total (5)
	Budget Period 1	Budget Period 2	Budget Period 3		
a. Personnel	$42,880.00	$44,595.00	$41,720.00		$129,195.00
b. Fringe Benefits	$14,150.00	$14,716.00	$13,768.00		$42,634.00
c. Travel	$365.00	$365.00	$244.00		$974.00
d. Equipment	$0.00	$0.00	$0.00		$0.00
e. Supplies	$0.00	$0.00	$0.00		$0.00
f. Contractual	$0.00	$0.00	$0.00		$0.00
g. Construction	$0.00	$0.00	$0.00		$0.00
h. Other	$5,000.00	$5,000.00	$3,000.00		$13,000.00
i. Total Direct Charges (sum of 6a-6h)	$62,395.00	$64,676.00	$58,732.00		$185,803.00
j. Indirect Charges	$31,367.00	$32,621.00	$30,518.00		$94,506.00
k. **Totals** (sum of 6i-6j)	$93,762.00	$97,297.00	$89,250.00		$280,309.00
7. Program Income					$0

Applicant Name: Interstate Renewable Energy Council Award Number: 0

Budget Information - Non Construction Programs

OMB Approval No. 0348-0044

Section A - Budget Summary

Grant Program Function or Activity	Catalog of Federal Domestic Assistance Number	Estimated Unobligated Funds		New or Revised Budget		
		Federal	Non-Federal	Federal	Non-Federal	Total
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Section B - Budget Categories

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NETL F 451.1-1/3
Revised: 12/3/2014
Reviewed: 12/3/2014
(Previous Editions Obsolete)

U.S. DEPARTMENT OF ENERGY

ENVIRONMENTAL QUESTIONNAIRE

I. INSTRUCTIONS

The proposer shall prepare this Environmental Questionnaire (EQ) as accurately and completely as possible. Supporting information can be provided as attachments. The proposer must identify the location of the project and specifically describe the activities that would occur at that location. The proposer must provide specific information and quantities, regarding air emissions, wastewater discharges, solid wastes, etc., to facilitate the necessary review. In addition, the proposer must submit with this EQ a FINAL copy of the project's statement of work (SOW) or statement of project objective (SOPO) that will be used in the contract/agreement between the proposer and the U.S Department of Energy (DOE).

II. QUESTIONNAIRE

A. PROJECT SUMMARY

1. Solicitation/Project Number: DE-FOA-0002740 Proposer: Generac Grid Services
2. This Environmental Questionnaire pertains to a: X Recipient or Prime Contractor □ Sub-recipient or Subcontractor
3. Principal Investigator: Gavin Hume Telephone Number: 604-998-8902
4. Project Title: Accelerating building thermal electrification while managing system impacts
5. Expected Project Duration: 5 years
6. Location of Activities covered by **this** Environmental Questionnaire: (City/Township, County, State):

   Various locations across the Commonwealth of Massachusetts

7. List the full scope of activities planned (only for the location that is the subject of this Environmental Questionnaire).

   Installation of new electric heat pumps and backup battery systems, as well as wi-fi thermostats and electric water heater controls.

8. List all other locations where work would be performed by the primary contractor of the project and subcontractor(s). Each of the following must have an individual Environmental Questionnaire.

Subcontractor or sub-recipient	Location of activities for this project
Not applicable	The Commonwealth of Massachusetts

9. Identify and select the checkbox with the predominant project work activities under Group A, B, or C

Group A

□ Routine administrative, procurement, training, and personnel actions. Contract activities/awards for management support, financial assistance, and technical services in support of agency business, programs, projects, and goals. Literature searches and information gathering, material inventories, property surveys; data analysis, computer modeling, analytical reviews, technical summary, conceptual design, feasibility studies, document preparation, data dissemination, and paper studies. Technical assistance including financial planning, assistance, classroom training, public meetings, management training, survey participation, academic contribution, technical consultation, and stakeholders surveys. Workshop and conference planning, preparation, and implementation which may involve promoting energy efficiency, renewable energy, and energy conservation.

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ENVIRONMENTAL QUESTIONNAIRE

***STOP!** If all work activities related to this project can be classified and described within categories under Group A, proceed directly to Section III CERTIFICATION BY PROPOSER. No additional information is required.*
If project work activities are described in either Group(s) B or C; then continue filling out questionnaire.

Group B

X Laboratory Scale Research, Bench Scale Research, Pilot Scale Research, Proof-of-Concept Scale Research, or Field Test Research. Work DOES NOT involve new building/facilities construction and site excavation/groundbreaking activities. This work typically involves routine operation of existing laboratories, commercial buildings/properties, offices and homes, project test facilities, factories/power plants, vehicles test stands and components, refueling facilities, utility systems, or other existing structures/facilities. Work will NOT involve major change in facilities missions and operations, land use planning, new/modified regulatory/operating permit requirements. Includes work specific to routine DOE Site operations and Lab research work activities, but NOT building construction and site preparation. DOE work typically involves laboratory facilities and lab equipment operations, buildings and grounds management activities; and buildings and facilities maintenance, repairs, reconfiguration, remodeling, equipment use and replacement.

Group C

□ Pilot Test Facilities Construction, Pilot Scale Research, Field Scale Demonstration, or Commercial Scale Application. Work typically involves facility construction, site preparation/excavation/groundbreaking, and/or demolition. This work would include construction, retrofit, replacement, and/or major modifications of laboratories, test facilities, energy system prototypes, and power generation infrastructure. Work may also involve construction and maintenance of utilities system right-of-ways, roads, vehicle test facilities, commercial buildings/properties, fuel refinery/mixing facilities, refueling facility, power plants, underground wells, and pipelines, and other types of energy research related facilities. This work may require new or modified regulatory permits, environmental sampling and monitoring requirements, master planning, public involvement, and environmental impact review. Includes work specific to DOE Site Operations and Lab operation activities involving building and facilities construction, replacement, decommissioning/demolition, site preparation, land use changes, or change in research facilities mission or operations.

B. PROPOSED PROJECT ALTERNATIVES

1. If applicable, list any project alternatives considered to achieve the project objectives.

   Not applicable.

C. PROJECT LOCATION

1. Provide a brief description of the project location (physical location, surrounding area, adjacent structures).

   The installations for this project will take place in single family low and moderate income (LMI) homes across the Commonwealth of Massachusetts. Specific locations have not been identified at this time.

2. **Attach** a project site location map of the project work area.

   Specific site locations have not been identified at this time.

D. ENVIRONMENTAL IMPACTS

NEPA procedures require evaluations of possible effects (including land use, energy resource use, natural, historic and cultural resources, and pollutants) from proposed projects on the environment.

1. Land Use

a. Characterize present land use where the proposed project would be located.

□ Urban	□ Industrial	□ Commercial	□ Agricultural
□ Suburban	□ Rural	X Residential	□ Research Facilities

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ENVIRONMENTAL QUESTIONNAIRE

□ Forest □ University Campus □ Other: _____

b. Identify the total size of the facility, structure, or system and what portion would be used for the proposed project.

Specific site information is not available at this time.

c. Describe planned construction, installation, and/or demolition activities, i.e., roads, utilities system right-of-ways, parking lots, buildings, laboratories, storage tanks, fueling facilities, underground wells, pipelines, or other structures.
X No construction would be anticipated for this project.

d. Describe how land use would be affected by operational activities associated with the proposed project.
X No land areas would be affected.

e. Describe any plans to reclaim areas that would be affected by the proposed project.
X No land areas would be affected.

f. Would the proposed project affect any unique or unusual landforms (e.g., cliffs, waterfalls, etc.)?
X No □ Yes (describe)

g. Would the proposed project be located in or near local, state, or federal parks; forests; monuments; scenic waterways; wilderness; recreation facilities; or tribal lands? X No □ Yes (describe)

2. Construction Activities and/or Operation

a. Identify project structure(s), power line(s), pipeline(s), utilities system(s), right-of-way(s) or road(s) that will be constructed and clearly mark them on a project site map or topographic map as appropriate. X None

b. Would the proposed project require the construction of waste pits or settling ponds?
X No □ Yes (describe and identify location, and estimate surface area disturbed)

c. Would the proposed project affect any existing body of water? X No □ Yes (describe)

d. Would the proposed project impact a floodplain or wetland? X No □ Yes (describe)

e. Would the proposed project potentially cause runoff/sedimentation/erosion? x No □ Yes (describe)

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ENVIRONMENTAL QUESTIONNAIRE

f. Would the proposed project include activities located on perma-frost, near fault zones, or involve fracturing, well drilling, geologic stimulation, sequestration, active seismic data collection, and/or deepwater operations?
X No □ Yes (describe)

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ENVIRONMENTAL QUESTIONNAIRE

g. Would the proposed project involve any of the following: nanotechnology; recombinant DNA or genetic engineering; facility decommissioning or disposition of equipment/materials; or management of radioactive wastes/materials?
X No □ Yes (describe)

3. Biological Resources

a. Identify any State or Federally listed endangered or threatened plant or animal species potentially affected by the proposed project.
X None

b. Would any designated critical habitat be affected by the proposed project? X No □ Yes (describe)

c. Describe any impacts that construction would have on any other types of sensitive or unique habitats.
X No planned construction □ No habitats □ None □ Impact (describe)

d. Would any foreign substances/materials be introduced into ground or surface waters, soil, or other earth/geologic resource because of project activities? How would these foreign substances/materials affect the water, soil, biota, and geologic resources? X No □ Yes (describe)

e. Would any migratory animal corridors be impacted or disrupted by the proposed project? X No □ Yes (describe)

4. Socioeconomic and Infrastructure Conditions

a. Would local socio-economic changes result from the proposed project? X No □ Yes (describe)

b. Would the proposed project generate increased traffic use of roads through local neighborhoods, urban or rural areas?
X No □ Yes (describe)

c. Would the proposed project require new transportation access (roads, rail, etc.)? Describe location, impacts, costs.
X No □ Yes (describe)

d. Would the proposed project create a significant increase in local energy usage? X No □ Yes (describe)

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ENVIRONMENTAL QUESTIONNAIRE

5. Historical/Cultural Resources

a. Describe any historical, archaeological, or cultural sites in the vicinity of the proposed project; note any sites included on the National Register of Historic Places. X None

b. Would construction or operational activities planned under the proposed project disturb any historical, archaeological, or cultural sites? X No planned construction □ No historic sites □ Yes (describe) □ No Impact (discuss)

c. Has the State Historic Preservation Office been contacted with regard to this project? X No □ Yes (describe)

d. Would the proposed project interfere with visual resources (e.g., eliminate scenic views) or alter the present landscape? X No □ Yes (describe)

e. Would the proposed project be located on or adjacent to tribal lands, lands considered to be sacred, or lands used for traditional purposes? Describe any known tribal sensitivities for the proposed project area.

No

6. Atmospheric Conditions/Air Quality

a. Identify air quality conditions in the immediate vicinity of the proposed project with regard to attainment of National Ambient Air Quality Standards (NAAQS). This information is available under the Green Book Non-Attainment Areas for Criteria Pollutants located at http://www.epa.gov/air/oaqps/greenbk/astate.html

	Attainment	Non-Attainment
O_3 - 1 Hour	X	□
O_3 - 8 Hour	X	□
SO_x	X	□
PM - 2.5	X	□
PM - 10	X	□
CO	X	□
NO_2	X	□
Lead	X	□

b. Would proposed project require issuance of new or modified local, state, or federal air permits to perform project related work and activities? X No □ Yes (describe)

c. Would the proposed project be in compliance with local and state air quality requirements? X Yes
If not, please explain.

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d. Would the proposed project be classified as either a New Source or a major modification to an existing source?
X No □ Yes (describe)

e. What types of air emissions, including fugitive emissions, would be anticipated from the proposed project, and what would be the maximum annual rate of emissions for the project?

	Maximum per Year	Total for Project
□ SO_x		
□ NO_x		
□ PM - 2.5		
□ PM - 10		
□ CO		
□ CO_2		
□ Lead		
□ H_2S		
□ Organic solvent vapors or other volatile organic compounds--List:		
□ Hazardous air pollutants -- List:		
□ Other -- List:		
X None		

f. Would any types of emission control or particulate collection devices be used?
X No □ Yes (describe, including collection efficiencies)

g. How would emissions be vented?

There will be no emissions generated by this project.

7. Hydrologic Conditions/Water Quality

a. What nearby water bodies may be affected by the proposed project? Provide distance(s) from the project site.

No nearby water bodies will be affected by the proposed project.

b. What sources would supply potable and process water for the proposed project?

None.

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ENVIRONMENTAL QUESTIONNAIRE

c. Quantify the wastewater that would be generated by the proposed project.

		Gallons/day	Gallons/year
□	Non-contact cooling water		
□	Process water		
□	Sanitary		
□	Other -- describe:		
X	None		

d. What would be the major components of <u>each</u> type of wastewater (e.g., coal fines)? X No wastewater produced

e. Identify the local treatment facility that would receive wastewater from the proposed project.
X No discharges to local treatment facility

f. Describe how wastewater would be collected and treated. X No wastewater produced

g. Would any run-off or leachates be produced from storage piles or waste disposal sites? X No □ Yes (describe source)

h. Would project require issuance of new or modified water permits to perform project work or site development activities?
X No □ Yes (describe)

i. Where would wastewater effluents from the proposed project be discharged? X No wastewater produced

j. Would the proposed project be permitted to discharge effluents into an existing body of water?
X No □ Yes (describe water use and effluent impact)

k. Would a new or modified National Pollutant Discharge Elimination System (NPDES) permit be required?
X No □ Yes (describe)

l. Would the proposed project adversely affect the quality or movement of groundwater? X No □ Yes (describe)

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ENVIRONMENTAL QUESTIONNAIRE

m. Would the proposed project require issuance of an Underground Injection Control (UIC) permit?
X No □ Yes (describe)

n. Would the proposed project be located in or near a wellhead protection area, drinking water protection area, or above a sole source aquifer or underground source of drinking water (USDW)?
X No □ Yes (describe)

8. Solid and Hazardous Wastes

a. Identify and estimate wastes that would be generated from the project. Solid wastes are defined as any solid, liquid, semi-solid, or contained gaseous material that is discarded, has served its intended purpose, or is a manufacturing or mining by-product (See EPA Municipal Solid Waste and Municipal Solid Waste by State).

	Annual Quantity
□ **Municipal solid waste (e.g., paper, plastic, etc.)**	
□ **Coal or coal by-products**	
□ **Other -- Identify:**	
□ **Hazardous waste – Identify:**	
X None	

b. Would project require issuance of new or modified solid waste and/or hazardous waste related permits to perform project work activities? X No □ Yes (explain)

c. How and where would solid waste disposal be accomplished?
X None generated
□ On-site (identify and describe location)
□ Off-site (identify location and describe facility and treatment)

d. How would wastes for disposal be transported?

No waste will be generated.

e. Describe hazardous wastes that would be generated, treated, handled, or stored under this project. Hazardous waste information can be found at EPA Hazardous Waste website. X None

f. How would hazardous or toxic waste be collected and stored? X None used or produced

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ENVIRONMENTAL QUESTIONNAIRE

g. If hazardous wastes would require off-site disposal, have arrangements been made with a certified TSD (Treatment, Storage, and Disposal) facility?
X Not required □ Arrangements not yet made □ Arrangements made with a certified TSD facility (identify)

9. Health/Safety Factors

a. Identify hazardous or toxic materials that would be used in the proposed project.
X None □ Hazardous or toxic materials that would be used (identify):

b. Describe the potential impacts of this project's hazardous materials on human health and the environment.
X None

c. Would there be any special physical hazards or health risks associated with the project? X No □ Yes (describe)

d. Does a worker safety program exist at the location of the proposed project? X No □ Yes (describe)

e. Would additional safety training be necessary for any new laboratory, equipment, or processes involved with the project?
X No □ Yes (describe)

f. Describe any increases in ambient noise levels to the public from construction and operational activities.
X None □ Increase in ambient noise level (describe)

g. Would project construction result in the removal of natural or other barriers that act as noise screens?
X No construction planned □ No □ Yes (describe)

h. Would hearing protection be required for workers? X No □ Yes (describe)

10. Environmental Restoration and/or Waste Management

a. Would the proposed project include CERCLA removals or similar actions under RCRA or other authorities?
X No □ Yes (describe)

U.S. DEPARTMENT OF ENERGY

ENVIRONMENTAL QUESTIONNAIRE

b. Would the proposed project include siting, construction, and operation of temporary pilot-scale waste collection and treatment facilities or pilot-scale waste stabilization and containment facilities? X No □ Yes (describe)

c. Would the proposed project involve operations of environmental monitoring and control systems?
X No □ Yes (describe)

d. Would the proposed project involve siting, construction, operation, or decommissioning of a facility for storing packaged hazardous waste for 90 days or less? X No □ Yes (describe)

E. REGULATORY COMPLIANCE

1. For the following laws, describe any existing permits, new or modified permits, manifests, responsible authorities or agencies, contacts, etc., that would be required for the proposed project

a. Resource Conservation and Recovery Act (RCRA): X None □ New Required □ Modification Required
Describe:

b. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA):
X None □ New Required □ Modification Required
Describe:

c. Toxic Substance Control Act (TSCA): X None □ New Required □ Modification Required
Describe:

d. Clean Water Act (CWA): X None □ New Required □ Modification Required
Describe:

e. Underground Storage Tank Control Program (UST): X None □ New Required □ Modification Required
Describe:

f. Underground Injection Control Program (UIC): X None □ New Required □ Modification Required
Describe:

g. Clean Air Act (CAA): X None □ New Required □ Modification Required
Describe:

U.S. DEPARTMENT OF ENERGY

ENVIRONMENTAL QUESTIONNAIRE

h. Endangered Species Act (ESA): X None □ New Required □ Modification Required
Describe:

i. Floodplains and Wetlands Regulations: X None □ New Required □ Modification Required
Describe:

j. Fish and Wildlife Coordination Act (FWCA): X None □ New Required □ Modification Required
Describe:

k. National Historic Preservation Act (NHPA): X None □ New Required □ Modification Required
Describe:

l. Coastal Zone Management Act (CZMA): X None □ New Required □ Modification Required
Describe:

2. Identify any other environmental laws and regulations (Federal, state, and local) for which compliance would be necessary for this project, and describe the permits, manifests, and contacts that would be required.

None.

F. DESCRIBE ANY ISSUES THAT WOULD GENERATE PUBLIC CONTROVERSY REGARDING THE PROPOSED PROJECT. X None

G. WOULD THE PROPOSED PROJECT PRODUCE ADDITIONAL DEVELOPMENT, OR ARE OTHER MAJOR DEVELOPMENTS PLANNED OR UNDERWAY, IN THE PROJECT AREA?

X No □ Yes (describe)

H. SUMMARIZE THE SIGNIFICANT IMPACTS THAT WOULD RESULT FROM THE PROPOSED PROJECT.

X None (provide supporting detail) □ Significant impacts (describe)

There would be no significant environmental impacts caused by the proposed project.

U.S. DEPARTMENT OF ENERGY

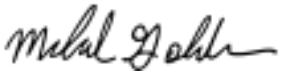
ENVIRONMENTAL QUESTIONNAIRE

I. PROVIDE A DESCRIPTION OF HOW THE PROJECT WOULD BE DECOMMISSIONED, INCLUDING THE DISPOSITION OF EQUIPMENT AND MATERIALS.

The owner of the PWRcell battery system and the qualified Generac Service Dealer shall prepare a written decommissioning plan that provides the overview of the decommissioning process developed specifically for the system that is to be decommissioned. The decommissioning plan shall provide the requirements and methods necessary to safely discharge the stranded energy in the battery modules and the proper removal from the installation site, including the transportation and recycling process for the battery modules.

III. CERTIFICATION BY PROPOSER

I hereby certify that the information provided herein is current, accurate, and complete as of the date shown immediately below.

Signature: 

Date (mm/dd/yyyy): 03/15/2023

Typed Name: Michael Goldman

Title: Director, Regulatory Affairs

Organization: Generac Grid Services

IV. REVIEW AND APPROVAL BY DOE

I hereby certify that I have reviewed the information provided in this questionnaire, have determined that all questions have been appropriately answered, and judge the responses to be consistent with the efforts proposed.

DOE Project Manager

Signature: _____ Date (mm/dd/yyyy): _____

Typed Name: _____

DISCLOSURE OF LOBBYING ACTIVITIES

Complete this form to disclose lobbying activities pursuant to 31 U.S.C.1352

OMB Number: 4040-0013
Expiration Date: 02/28/2022

1. * Type of Federal Action:
- [ ] a. contract
- [x] b. grant
- [ ] c. cooperative agreement
- [ ] d. loan
- [ ] e. loan guarantee
- [ ] f. loan insurance

2. * Status of Federal Action:
- [ ] a. bid/offer/application
- [x] b. initial award
- [ ] c. post-award

3. * Report Type:
- [x] a. initial filing
- [ ] b. material change

4. Name and Address of Reporting Entity:

[ ] Prime [x] SubAwardee Tier if known:

** Name:* Interstate Renewable Energy Council

** Street 1:* 125 Wolf Road, Suite 100 *Street 2:*

** City:* Albany *State:* NY: New York *Zip:* 12205

Congressional District, if known: NY-20

5. If Reporting Entity in No.4 is Subawardee, Enter Name and Address of Prime:

** Name:* Generac Power Systems

** Street 1:* S45W29290 Hwy 59 *Street 2:*

** City:* Waukesha *State:* WI: Wisconsin *Zip:* 53189

Congressional District, if known: WI-05

6. * Federal Department/Agency:

Department of Energy

7. * Federal Program Name/Description:

Grid Resilience and Innovation Partnerships (GRIP)

CFDA Number, *if applicable:*

8. Federal Action Number, *if known:*

BIL 40107

9. Award Amount, *if known:*

$

10. a. Name and Address of Lobbying Registrant:

Prefix: ** First Name:* n/a *Middle Name:*

** Last Name:* n/a *Suffix:*

** Street 1:* *Street 2:*

** City:* *State:* *Zip:*

b. Individual Performing Services (including address if different from No. 10a)

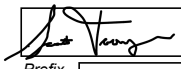
Prefix: ** First Name:* n/a *Middle Name:*

** Last Name:* n/a *Suffix:*

** Street 1:* *Street 2:*

** City:* *State:* *Zip:*

11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when the transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

*** Signature:** 

***Name:** *Prefix:* Mr. ** First Name:* Scott *Middle Name:*

** Last Name:* Townley *Suffix:*

Title: Director of Finance & Administration **Telephone No.:** 202 412-9028 **Date:** 3/02/2023

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DISCLOSURE OF LOBBYING ACTIVITIES

Complete this form to disclose lobbying activities pursuant to 31 U.S.C.1352

OMB Number: 4040-0013
Expiration Date: 02/28/2025

1. * Type of Federal Action:

- [ ] a. contract
- [x] b. grant
- [ ] c. cooperative agreement
- [ ] d. loan
- [ ] e. loan guarantee
- [ ] f. loan insurance

2. * Status of Federal Action:

- [ ] a. bid/offer/application
- [x] b. initial award
- [ ] c. post-award

3. * Report Type:

- [x] a. initial filing
- [ ] b. material change

4. Name and Address of Reporting Entity:

- [x] Prime
- [ ] SubAwardee

** Name:* Generac Grid Services

** Street 1:* 1515 Wynkoop St, Suite 710 *Street 2:*

** City:* Denve *State:* CO *Zip:* 80202

Congressional District, if known:

5. If Reporting Entity in No.4 is Subawardee, Enter Name and Address of Prime:

6. * Federal Department/Agency:

Department of Energy

7. * Federal Program Name/Description:

Grid Resilience and Innovation Partnerships (GRIP)

CFDA Number, *if applicable:*

8. Federal Action Number, *if known:*

BIL 40107

9. Award Amount, *if known:*

$

10. a. Name and Address of Lobbying Registrant:

Prefix: ** First Name:* n/a *Middle Name:*

** Last Name:* n/a *Suffix:*

** Street 1:* *Street 2:*

** City:* *State:* *Zip:*

b. Individual Performing Services (including address if different from No. 10a)

Prefix: ** First Name:* n/a *Middle Name:*

** Last Name:* n/a *Suffix:*

** Street 1:* *Street 2:*

** City:* *State:* *Zip:*

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*** Signature:** Completed on submission to Grants.gov

***Name:** *Prefix:* ** First Name:* Michael *Middle Name:*

** Last Name:* Goldman *Suffix:*

Title: Director, Regulatory Affairs **Telephone No.:** 608-213-3570 **Date:** Completed on submission to Grants.gov

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Locations of Work (DE-FOA-0002740)

Prime or Sub	Name	City	State	Zip Code + 4
Prime	Generac Grid Services	Multiple Cities and Environmental Justice Communities across Massachusetts	MA	Multiple

Generac Grid Services LLC
1515 Wynkoop St, Suite #710
Denver, CO 80202

P: (866) 957-3672
W: www.Generac.com

March 13, 2023

U.S. Department of Energy, National Energy Technology Laboratory

Re: Reporting of Potentially Duplicative Funding

To whom it may concern:

Generac Grid Services has no active awards of federal funds. There is no potential of funding overlap for the activities stated in Funding Opportunity Announcement (FOA) Number: DE-FOA-0002740.

Sincerely,

Michael Goldman
Director, Business Development and Regulatory Affairs
mgoldman@generacgs.com
608-213-3570

Department of Energy
Golden Field Office
15013 Denver West Parkway
Golden, Colorado 80401-3393

NEGOTIATED INDIRECT COST RATE AGREEMENT

September 18, 2020

Fraunhofer USA, Center for Manufacturing Innovations (CMI)
15 St. Mary's Street
Brookline, MA 02446

PREAMBLE

The purpose of this Agreement is to establish indirect cost rates for use in award and management of Federal contracts, grants, and other assistance arrangements to which Code of Federal Regulations (CFR) 2 CFR 200 applies. It consists of four parts: I -Rates and Bases; II - Particulars; III -Special Remarks; and IV - Approvals. This Agreement has been negotiated by the Department of Energy on behalf of the Federal Government pursuant to the authority cited in Appendix IV, of 2 CFR 200.

BILLING RATE: FRINGE

	EFFECTIVE PERIOD			ALLOCATION
TYPE	FROM	TO	RATE (%)	BASE *
FINAL	01/01/19	12/31/19	66.7%	(a)
PRED	01/01/20	12/31/24	60.0%	(a)

INDIRECT RATE: G & A

	EFFECTIVE PERIOD			ALLOCATION
TYPE	FROM	TO	RATE (%)	BASE *
FINAL	01/01/19	12/31/19	206.0%	(b)
PRED	01/01/20	12/31/24	116.0%	(b)

* BASIS FOR ALLOCATION:
(a) Total Labor Costs
(b) Total Direct Costs

TREATMENT OF FRINGE BENEFITS:

This organization uses a fringe benefit rate which is applied to direct & indirect salaries and wages (total labor dollars) for both budgeting and charging purposes for Federal projects. In addition to health, personnel insurances also including dental and life insurance, the directly claimed fringe benefits pool consist of payroll taxes, personnel insurances, workers compensation insurance, bonus, pension, university fringe, and paid leave which includes vacation, personal days, sick days, other days and holidays.

SECTION II -PARTICULARS

SCOPE:

The indirect cost rates contained herein are for use with grants, and other financial assistance agreements awarded by the Federal Government to the above department or agency and subject to the rules and regulations under 2 CFR 200. Because of legal constraints, predetermined rates are not permitted for Federal contracts; they may, however, be used for grants or cooperative agreements.

LIMITATIONS:

Application of the rates contained in this agreement is subject to all statutory or administrative limitations on the use of funds, and payments of costs hereunder, are subject to the availability of appropriations applicable to a given grant or contract. Acceptance of the rates agreed to herein is predicated on the following conditions: (a) no costs other than those incurred by the Recipient were included in the entity's indirect cost pools as finally accepted, and that such costs are legal obligations of the Recipient and allowable under the governing cost principles; (b) the same costs that have been treated as indirect costs are not claimed as direct costs; (c) similar types of costs have been accorded consistent accounting treatment; and (d) the information which was provided by the agency, and which was used as a basis for acceptance of rates agreed to herein, is not subsequently found to be materially incomplete or inaccurate.

CHANGES:

Final and Predetermined rates contained in this agreement are based on the accounting system in effect at the time the agreement was negotiated. When changes to the method of accounting for cost affect the amount of reimbursement resulting from the use of this rate, the change will require the prior approval of the authorized representative of the Cognizant negotiation agency. Such changes include, but are not limited to, changing a particular type of cost from an indirect to a direct charge. Failure to obtain such approval may result in subsequent cost disallowances. The Cognizant negotiating agency must also be notified of any changes to the State's or Locality's organizational structure, which affect the amount of reimbursement resulting from the use of the rates.

RATE(S):

FINAL: The Final rate(s) contained in this Agreement are based on the actual, allowable costs incurred for a preceding fiscal period. In accordance with applicable Federal regulations (2 CFR 200, Appendix IV) governing indirect cost rates for your award(s), provisional rates are not to be construed as determinative of the indirect costs to be distributed or of the bases of distribution to be used in the final settlement of your award(s).

PREDETERMINED: Public Law 87-638 (76 Stat. 437) as amended (41 U.S.C. 4708) authorizes the use of predetermined rates in determining the "indirect costs" applicable under research agreements. The stated objectives of the law are to simplify the administration of cost-type research and development contracts (including grants), to facilitate the preparation of budgets, and to permit more expeditious closeout of such contracts when the work is completed. Predetermined rates are not subject to adjustment during the time period which this agreement covers.

NOTIFICATION TO OTHER FEDERAL AGENCIES:

Copies of this document may be provided to other Federal agencies as means of notifying them of the Agreement contained herein.

ADJUSTMENTS TO REIMBURSEMENTS:

Current reimbursements for indirect costs to the above department or agency by means other than the rates set forth in this agreement should be adjusted to reflect the use of these approved rates within 30 days of the effective date of this agreement. These rates shall be applied to the appropriate base to identify the proper amount of indirect costs allocable to the Federal awards covered by this agreement.

SECTION III -SPECIAL REMARKS

1. This agreement is effective on the date of approval by the Federal Government.
2. Questions regarding this agreement should be directed to the Federal Government negotiator referenced in Section IV.

SECTION IV –APPROVALS

For the Non-Profit Organization:

Fraunhofer, CMI

Signature

Dr. Andre Sharon
Name

Executive Director, FhUSA CMI
Title

Oct. 29, 2020
Date

For the Cognizant Negotiation Agency on Behalf of the Federal Government:

U.S. Department of Energy

Signature

Pamela T. Lavergne
Name

Contracting Officer
Title

September 18, 2020
Date

240-562-1474
Telephone

DISCLOSURE OF LOBBYING ACTIVITIES

Complete this form to disclose lobbying activities pursuant to 31 U.S.C.1352

OMB Number: 4040-0013
Expiration Date: 02/28/2025

1. * Type of Federal Action:

- [ ] a. contract
- [x] b. grant
- [ ] c. cooperative agreement
- [ ] d. loan
- [ ] e. loan guarantee
- [ ] f. loan insurance

2. * Status of Federal Action:

- [ ] a. bid/offer/application
- [x] b. initial award
- [ ] c. post-award

3. * Report Type:

- [x] a. initial filing
- [ ] b. material change

4. Name and Address of Reporting Entity:

[ ] Prime [x] SubAwardee Tier if known:

*Name: Fraunhofer USA, Inc.

*Street 1: 15 St. Mary's St. Street 2:

*City: Brookline State: MA: Massachusetts Zip: 02446

Congressional District, if known:

5. If Reporting Entity in No.4 is Subawardee, Enter Name and Address of Prime:

*Name: Generac Grid Services

*Street 1: 1515 Wynkoop St. Street 2: Suite 710

*City: Denver State: CO: Colorado Zip: 80202

Congressional District, if known:

6. * Federal Department/Agency:

Department of Energy

7. * Federal Program Name/Description:

Grid Resilience and Innovation Partnerships (GRIP)

CFDA Number, *if applicable:* 81.254

8. Federal Action Number, *if known:*

DE-FOA-0002740

9. Award Amount, *if known:*

$

10. a. Name and Address of Lobbying Registrant:

Prefix * First Name Middle Name

* Last Name Suffix

* Street 1 Street 2

* City State Zip

b. Individual Performing Services (including address if different from No. 10a)

Prefix * First Name Middle Name

* Last Name Suffix

* Street 1 Street 2

* City State Zip

11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when the transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

*** Signature:**

***Name:** Prefix * First Name: Laurie Middle Name

* Last Name: Fuciarelli Suffix

Title: Grants and Contracts Manager **Telephone No.:** 734-354-4337 **Date:** 03/13/2023

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Accelerating Building Thermal Electrification while Managing System Impacts

Project Title: Accelerating Building Thermal Electrification while Managing System Impacts

Prime Recipient: Generac Grid Services

Project Partners: Generac Grid Services, Interstate Renewable Energy Council (IREC), Fraunhofer Center, Cape Light Compact, Unitil, Eversource Energy, National Grid, Action for Boston Community Development (ABCD), Massachusetts Clean Energy Center (project collaborator)

Project Manager: Gavin Hume, Generac Grid Services

Key Personnel: Michael Goldman/Gavin Hume – Generac Grid Services; Dr. Kurt Roth & Matt Kromer – Fraunhofer Center; Kristen Hagerty – Interstate Renewable Energy Council; James Collins – Action for Boston Community Development

Requested DOE Funds: $49,835,370

Applicant Cost Share: 51.56%

Project's key idea/takeaway

This project will show how it is possible to electrify the building thermal sector while increasing customer and system reliability by using aggregated distributed energy resources controlled through a distributed energy resource management system (DERMS). The goal of this project is to minimize the potential negative impacts of heating electrification on the reliability of the distribution system while reducing the need to build new infrastructure and at the same time helping to accelerate the deployment of smart building solutions that will be critical in reducing GHG emissions. The project team will prioritize engagement and alignment with community-based organizations to ensure that all systems are installed in historically underserved and overburdened communities and that there are corresponding job training opportunities.

Accelerating Building Thermal Electrification while Managing System Impacts

Technology Summary: The goal is to demonstrate that efficient building electrification can be done while minimizing system overloads, reliability issues, and the need for infrastructure upgrades. This project will use Generac's Concerto Distributed Energy Resource Management System (DERMS) to send control signals to heat pumps, thermostats, water heating load control switches, and batteries to minimize and optimize the impacts of new heating and transportation electrification load on the grid.

Technology Impact: By combining batteries and other controllable distributed energy resources (DERs) with heat pumps, the anticipated impacts are expected to be:

- Reduce forecasted winter morning peaks at the ISO-NE level by 5 kW per battery or approximately 10 MW when all ~2,000 planned batteries are installed
    - Subsequent phases of this project have the potential to more specifically analyze impacts at the distribution system level
- Use a fleet of batteries to soak up excess solar production during light load conditions, helping to mitigate reverse power flow
- Co-optimize the battery fleet to also participate in the Massachusetts Program Administrator's ConnectedSolutions Program, which focuses on reducing the current coincident ISO NE peak hour in the summer

The initial focus of the project team will be on low to moderate income customers living in owner-occupied single-family homes. The team will engage with low-income advocates in the energy space and community action agencies to identify and recruit target customers. The project will use a community-based outreach model to engage LMI households both as customers and as workforce development participants.

Project Goals: The high level goals of this project are to 1) Demonstrate that new electric load from heat pumps can be partially offset through the control and optimization of other household distributed energy resources such as batteries, wi-fi thermostats, and hot water control switches; 2) Create Virtual Power Plants in furtherance of Objective #1; 3) Develop forecasts to anticipate new localized and system peaks caused by building thermal electrification; 4) Develop optimization algorithms to influence the dispatch of behind the meter assets; 5) Connect workers, training programs, and employers; 6) Provide resilience for LMI customers by providing them with battery backup power; 7) Provide resilience for the grid by minimizing potential equipment overloads; and 8) Support small businesses, women and minority owned businesses

COMMUNITY BENEFITS PLAN

The success of this project depends on a high degree of engagement and alignment with local community leaders and implementation partners. As the energy transition accelerates, the project team is committed to ensuring that no demographic is left behind. The 2,000 heat pumps and smart thermostats will be provided at no cost to low-income residents and at a low cost to moderate income residents in underserved and disadvantaged communities. The approximately 2,000 batteries will be provided at no cost to low- and moderate-income residents in underserved and disadvantaged communities. The communities in need will be identified using The Council on Environmental Quality (CEQ) Climate and Economic Justice Screening Tool, the DOE Energy Justice Mapping Tool, and the Massachusetts Environmental Justice Viewer.

The team is taking a multi-faceted approach by working with partners that have worked in these Massachusetts communities and offer energy and workforce development expertise. Energy service and delivery expertise will be provided by utilities and energy efficiency program administrators (National Grid, Eversource, Cape Light Compact and Unitil), a manufacturer and energy service provider (Generac), and a Building Energy Systems expert (Fraunhofer USA). Workforce training and outreach will be supported by a state energy agency with workforce expertise (Massachusetts Clean Energy Center) and a national organization with energy workforce expertise (Interstate Renewable Energy Council), who will help identify and support Minority Business Enterprises, Minority-Owned Businesses, Woman-Owned Businesses, Native American-owned businesses, LGBT-owned business, and Veteran-Owned Businesses. Critically, the team will partner with Action for Boston Community Development (ABCD) as a trusted CBO that focuses on serving low-income residents and is well-connected with neighborhood community service centers throughout the state.

The project team will prioritize engagement and alignment with these organizations to ensure that project benefits are realized by historically underserved and overburdened communities. The partners will play a key role in achieving the goals in each part of the Community Benefits Plan, as outlined below.

COMMUNITY AND LABOR ENGAGEMENT

Engagement with stakeholders will ensure community perspectives are incorporated to better understand barriers customers encounter when installing distributed energy resources (DERs), while also establishing a set of metrics to benchmark and measure success toward achieving the intended equity related outcomes. To effectively reach low-income customers and help build a diverse workforce, it is essential to engage the local community and other on-the-ground stakeholders. We will work closely with partners with strong ties in these communities, specifically ABCD. We will build on their existing programs and expertise and incorporate their input early in the implementation plan.

Action for Boston Community Development (ABCD), and their statewide network of partnering Community Action Agencies, including Action, Inc., offer a unique combination of access to low-income communities and expertise in the management of leading-edge energy programs. Massachusetts Community Action agencies share a core mission of alleviating poverty, deliver a wide range of services to disadvantaged communities, including energy related assistance. ABCD and its cohort of partners

deliver federally funded LIHEAP, Weatherization and HEARTWAP services, as well as state and public utility funded projects which install newer energy conservation technologies such as multi zone air source heat pumps and solar PV systems. In 2021, ABCD assisted 32,612 households obtain LIHEAP benefits, helped 1,310 lower their energy bills with weatherization services and heating system upgrades, and provided 1,587 single family households with appliance audits and product upgrades. As a partner, ABCD will coordinate outreach, communications, enrollment, and implementation strategies which effectively engage low-income and disadvantaged residents.

Collaboration priorities with ABCD includes:

1. Coordination with other Community Action Agencies, notably lead partner Action, Inc., to provide access to targeted Environmental Justice Communities (ESJ).

2. Analysis of lessons learned in the management of current energy efficiency programs, and identification of potential operational synergies with the GRIP initiative.

3. Information and resource sharing with regional LIHEAP programs to identify eligible residents in LMI communities.

4. Customer acquisition, including development of signed customer contracts.

5. Integration of combined heat pump and battery installation as part of the scope of work for eligible households engaged in other energy efficiency programs.

6. Support for mitigation of any existing pre-electrification barriers before heat pump installation.

7. Oversight of equipment installation.

8. Maintenance and management of customer relationships either directly or through partnerships with other Community Action Agencies.

INVESTING IN THE AMERICAN WORKFORCE

Between 2022-2024, Massachusetts is investing over $49 million to train a more diverse and field-ready clean energy workforce across communities. Melissa Hoffer, Massachusetts's first Climate Chief recently discussed a cross cabinet effort, between labor and workforce development, economic development, education, and energy and environmental affairs, to address the shortage of electricians, estimated at approximately 30,000 to 40,000 — that are needed to power the clean-energy transition in Massachusetts. Our partnerships with the Interstate Renewable Energy Council (IREC) and the Massachusetts Clean Energy Center (MassCEC) will ensure that the project is integrated into state investments and initiatives that support an equity-based clean energy workforce. These organizations are also well connected with local community and labor organizations – connections that will be important in training and building a skilled and diverse workforce.

As DER adoption scales, the need for the next generation of technicians who can perform this type of work will grow substantially. These jobs will offer training and a pathway to more opportunities in the DER sector after this initiative is completed. Our goal is for this project to serve as a replicable model of DER deployment, so it is essential to undertake a workforce development program that can be adapted and implemented in other locations as well. The project's workforce development activities will be documented with a case study to capture effective strategies, monitor progress against objectives, and lessons learned. Job participants will be invited to provide feedback throughout the project via pre- and post-tests, satisfaction questionnaires, and group interviews. The case study will outline how this approach can be replicated to support a widespread equitable energy transition. Together with these organizations we will develop detailed recruitment and workforce training plans that meet project goals and contribute to state goals and programs.

The Massachusetts Clean Energy Center (MassCEC) is the state economic development agency dedicated to accelerating the growth of the clean energy sector across the Commonwealth. One of the central goals of the agency is to grow and diversify the clean energy workforce. Their workforce programs increase access to clean energy careers, education, and training with a focus on bringing these opportunities to historically underserved communities across Massachusetts. In the fall of 2022, MassCEC announced $3.6M across 25 initial Equity Workforce Grantees[1]. These awards address the need to grow Massachusetts' clean energy workforce, while prioritizing diversity, equity, and inclusion efforts across the full spectrum of economic opportunity, yielding an increasingly diverse bench of trained new workers and a wider array of minority and women-owned business enterprises to help lead climate-critical work. As discussed with MassCEC, once this project is initiated the project partners will structure an outreach and training plan starting in Q1 of this project.

Collaboration priorities with MassCEC include:

1. Structured training and employment opportunities including on the job training, apprenticeships, and strategies for LMI and MWBE workers to gain credentials for the installation of batteries, heat pumps and smart thermostats partnerships. To create opportunities in low moderate income (LMI) and MWBE communities, we will work with:
    i. Equity Workforce Training organizations, 16 in total, that prepare individuals in environmental justice communities and fossil fuel workers for clean energy careers.
    ii. Minority and Women Owned Business Enterprises Support Implementation and Planning community-based organizations, 9 in total, that advance efforts to assist over 199 Minority and Women Owned Business Enterprises.

2. MassCEC also administers the Empower program[2], which offers multiple stages of investment in communities and community-based organizations so that they can explore, develop, and implement program models or projects that provide access to the benefits of clean energy for previously underserved populations.
    i. Partner with Empower's Implementation Grant Awardees who implement community-based projects that increase access to the benefits of clean energy and reduce energy

[1] For more information, see:https://www.masscec.com/press/baker-polito-administration-announces-36m-funding-equity-workforce-training-and-minority-and

[2] https://www.masscec.com/program/empower-massachusetts

burden on underserved population and provide access to heat pumps, batteries, and smart thermostats.

The Interstate Renewable Energy Council (IREC) has decades of experience in grid capacity analysis, workforce development, and producing tangible results from stakeholder convenings. IREC is uniquely qualified to support this ambitious project and deliver recommendations to replicate and scale it. IREC will provide management oversight for the workforce development component of this project.

Collaboration priorities with IREC includes:

1. Yearly Community Event focusing on recruiting WMBE contractors into the program.

2. Bi-annual Advisory Board meetings, focusing on workers and contractors in the program.

3. Outreach and educational materials for partners to make sure that learners and trainees have a full understanding of the project's grid resilience goals.

4. Leverage of existing tools and resources from a learner-centric lens, with the goal of establishing a pipeline of workers for placement and advancement in high road jobs with sustainable wages that provide opportunities for growth and advancement.

5. Sharing of insights and recommendations to help develop and strengthen the program through its maturity, to be responsive to the needs of consumers, trainers, trainees, and employers.

ADVANCING DIVERSITY, EQUITY, INCLUSION, AND ACCESSIBILITY

This project will prioritize the inclusion of communities that have been historically underserved or underrepresented in the energy transition. The project team will work with trusted community-based organizations (CBOs), and state energy agencies to ensure that project benefits flow to historically underserved communities. With 100 percent of the project implemented directly in underserved communities, we aim to empower those households to transition to a clean energy efficient home and reduce their energy costs, while improving resiliency benefits for low-income communities that are disproportionately affected by power outages[3]. Coordination with ABCD, IREC and MassCEC and the Massachusetts Supplier Diversity Office (SDO) which provides a directory of disadvantaged business enterprises will create a pathway to understand the demographic in the community and provide insight on the right types of job training our project partners need to support a diverse, inclusive and equitable workforce.

[3] https://www.utilitydive.com/news/energy-system-inherently-racist-utilities-responding-equity-ej-justice40/634203/

To meet the Justice40 initiative goals, the project will prioritize serving low-income and Environmental Justice Communities – these communities have been historically marginalized, underserved and overburdened by energy costs, pollution and power shutoffs. In addition to resiliency benefits and cost savings, we seek to improve access to clean energy information. With input from our various partnerships, we will improve awareness by low-income residents of the technology, energy savings and health benefits as they adopt the various products in their homes. Our focus will be shaped by federal tools that guide Justice4 implementation, including the CEQ Climate and Economic Justice Screening Tool, the DOE Energy Justice Mapping Tool and state frameworks. The Massachusetts Executive Office of Energy & Environmental Affairs defines environmental justice populations as a neighborhood where one or more of the following criteria are true[4]:

- Annual median household income is 65 percent or less of the statewide annual median household income.
- Minorities make up 40 percent or more of the population.
- 25 percent or more of households identify as speaking English less than "very well."
- Minorities make up 25 percent or more of the population and
- Annual median household income of the municipality in which the neighborhood is located does not exceed 150 percent of the statewide annual median household income.

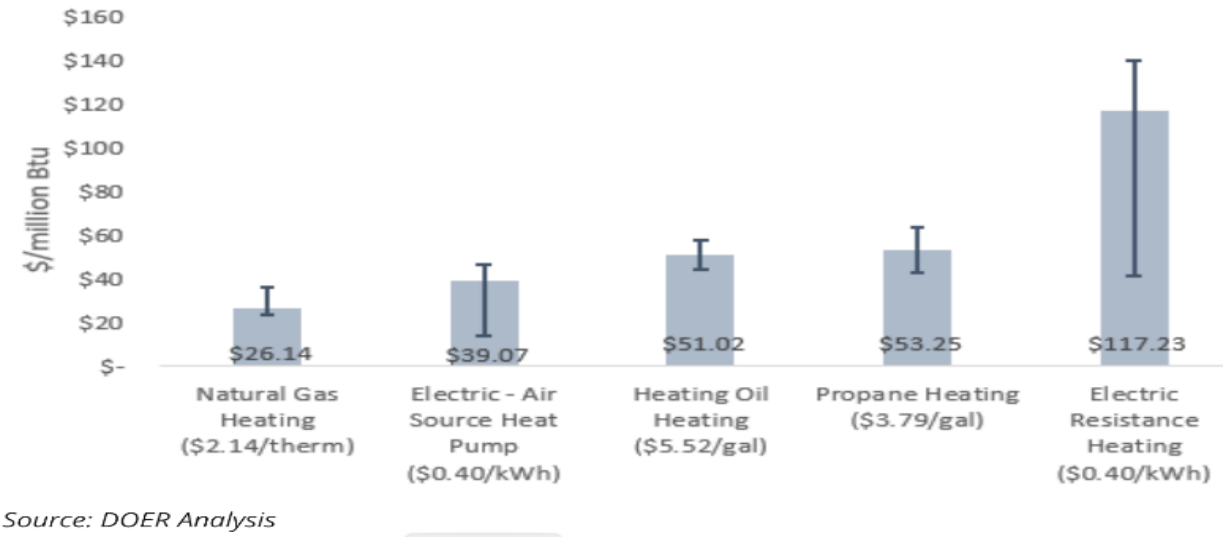
Our partnerships with experts on-the-ground and trusted community partners will be essential in achieving our Justice40 project goals. We will apply best practices on implementation from our partner organizations and utilities with success in running similar programs, such as Cape Light Compact described in more detail in the subsequent sections. We will work closely with ABCD and their network of Community Action Agencies to identify low-income and Energy Justice community residents who may benefit most from this project and learn how to best communicate the project benefits. MassCEC and IREC will ensure that this project contributes to building a more skilled and diverse clean energy workforce.

1. Decrease energy burden in disadvantaged communities (DACs).

By deploying all 2000 heat pumps and batteries in LMI communities we intend to decrease the energy burden in these disadvantaged communities. As outlined below, the cost to produce heat in Massachusetts during the winter of 2022 and 2023 varies widely depending on the technology[5].

[4] https://www.mass.gov/info-details/massgis-data-2020-us-census-environmental-justice-populations
[5] https://www.mass.gov/info-details/massachusetts-household-heating-costs

Figure 2: Cost to Produce Heat this Winter (2022/23) for Different Technologies



Source: DOER Analysis

In 2022, ABCD estimated that an average gallon of heating oil in Massachusetts cost $3.43, nearly double from the previous year. To fill a tank, it cost about $800. While natural gas is cheaper, costs were still up 30% — increasing the average bill by $287. Heat pumps provide a savings between $150-$600 which makes a significant impact for most LMI households where the Annual Per Capita Income in Massachusetts in disadvantaged communities is $48,225.

The analysis below developed by project partners the Cape Light Compact shows the potential financial benefits for moderate and low-income customers in deed-restricted housing before and after participating in the Cape and Vineyard Electrification Offering (CVEO), by switching from oil heat to heat pumps and other electrified end uses in Massachusetts. These financial benefits will accrue to the most vulnerable customers, in addition to all of the other benefits listed above that will flow to both the individual participants of this program and the community at large.

Figure 2. Moderate-Income deed-restricted housing customer heating with oil before CVEO participation

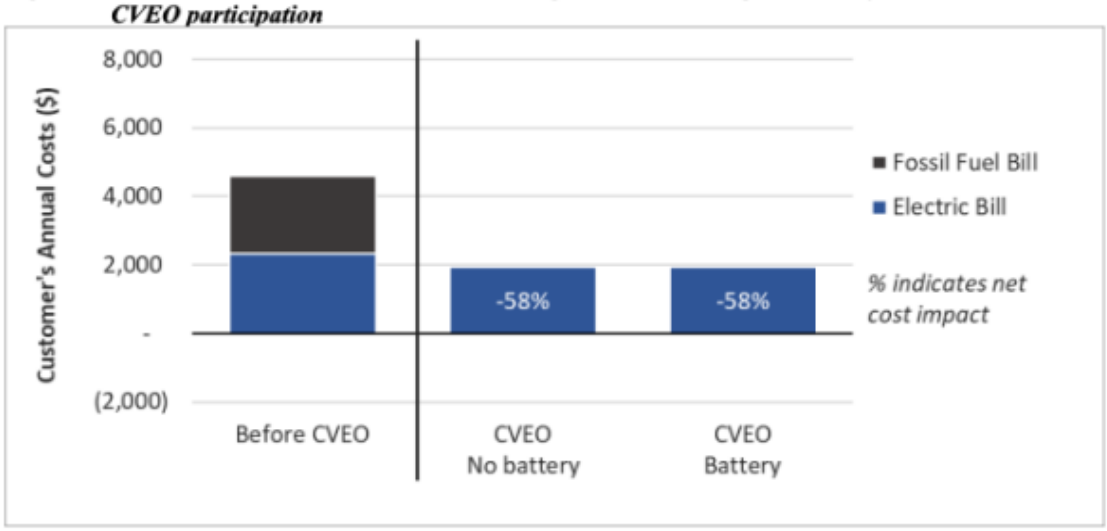
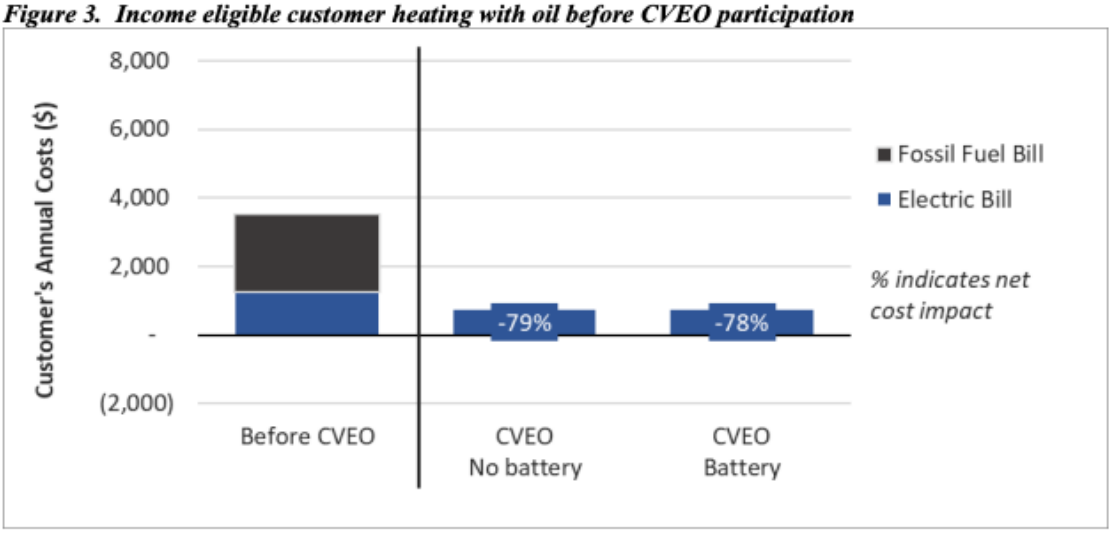


Figure 3. Income eligible customer heating with oil before CVEO participation



By working closely with Community Action Agencies that are already providing critical services to these households, we will be able to track annual household savings as result of the integration of heat pumps, batteries and thermostats.

2. Decrease environmental exposure and burdens for DACs

Accelerating building thermal electrification as Massachusetts transitions from fossil fuel-based furnaces and boilers to heat pumps, provides tremendous non-energy benefits (NEB) such as improved comfort, health, safety, and productivity. A comprehensive, integrative study was conducted to reexamine and quantify the health and safety-related non-energy benefits[6] of the single-family low-income weatherization program in Massachusetts, including reduced asthma, thermal stress, home fire, and carbon monoxide poisoning; reduced losses in work income; reduced use of short-term predatory loans; and increased home productivity. This study employed the methodology developed in a 2015 U.S. DOE study of its Weatherization Assistance Program. Weatherization can produce health- and safety-related non-energy benefits directly by changing the physical condition of homes. The total value of the health-related NEBs (reduced asthma, thermal stress, and losses in work income) increased from $19 to $769 per weatherized home annually. The results of this study encourage our project; deploying the fleet of ~2,000 heat pumps will help LMI residents' transition away from fossil fuel furnaces and achieve health and comfort benefits. And it's not just weatherization, utilities are currently counting those NEBs for each heat pump installed. Our engagement with the Community Action Agencies will allow us to follow 2,000 participating residents and assess and report on the NEBs from integrating heat pumps, batteries, thermostats and water heater controls into their homes.

3. Increase parity in clean energy technology (e.g., solar, storage) access and adoption in DACs.

The entire fleet of ~2,000 heat pumps, batteries, thermostats, and water heater controls will be installed in LMI disadvantaged communities. With this investment, we will improve access to clean energy

[6] Christopher Chan, Eversource Energy, Westwood, MA Greg Clendenning, NMR Group, Inc., Somerville, MA Beth Hawkins, Three3 , Inc., Knoxville, TN Erin Rose, Three3 , Inc., Knoxville, TN Bruce Tonn, Three3 , Inc., Knoxville, TN (2019); *Saving Lives through Energy Efficiency: Valuing the Health and Safety-Related Benefits of Weatherization in Low-Income Homes*.

technology and its associated cost-savings and resiliency benefits for LMI residents and EJ communities. We will combine Generac PWRCell home battery systems, ecobee thermostats paired with air-source pumps, and hot water heater load control switches (where applicable), where approved as part of statewide energy efficiency programs in residential buildings. The goal is to demonstrate that it is possible to electrify the building thermal sector without causing system overloads, reliability issues, or needing expensive infrastructure upgrades. This project will use Generac's Concerto™ Distributed Energy Resource Management System (DERMS) to send control signals to heat pumps, thermostats, water heating load control switches, and batteries to minimize and optimize the impacts of new heating and transportation electrification load on the grid. During times of grid stress, the thermostats can be used to pre-heat or pre-cool a conditioned space, immediately ramp the heat pumps up or down, with the batteries dispatching to cover additional heat pump load.

By working closely with ABCD and other trusted partners, we will reach low-income residents and Environmental Justice Communities that have been left out of the clean energy transition thus far. LMI-income residents face significant cost and knowledge barriers in adopting DERs. Utility and energy efficiency program administrator partners will provide incentives to customers for heat pumps through energy efficiency and demand side management programs, Generac will provide batteries, smart thermostats, and software through grant funds, and other key partners will use grant funds to focus on workforce training programs.

4. Increase access to low-cost capital in DACs.

The DOE funding will offset the cost of battery storage and energy management equipment being provided to LMI households. Additionally, utility and energy efficiency program administrator partners will provide incentives to customers for heat pumps and thermostats through energy efficiency and demand side management programs. Generac will provide batteries, smart thermostats, and software with the grant funding, and other key partners will use the grant funds to deploy workforce training programs. This proposal does not rely on the use of the 30% federal investment tax credit to finance stand-alone batteries because many LMI customers may not have sufficient taxable income to utilize the tax credit. While low-cost capital access will be important for scaling this program in the future, our focus for this proposal is to demonstrate the reliability and resiliency benefits to LMI customers and their communities from combining batteries and energy management services/controls with electric heat pumps.

5. Increase clean energy enterprise creation and contracting (MBE/DBE) in DACs.

The project team will work closely with MassCEC to support Minority- and Women-Owned Businesses in the clean energy workforce. The project team will also leverage other existing state initiatives such as the Massachusetts Supplier Diversity Office's disadvantaged business enterprise database to prioritize contracts with these companies.

6. Increase clean energy jobs, job pipeline, and job training for individuals from DACs.

Benefits from this project will accrue to disadvantaged communities in multiple ways, including increased training and skill-building opportunities, employment, decreased energy burden through lower heating costs, increased resiliency, and lower emissions. We discuss the benefits of our

partnership with IREC and MassCEC in the workforce section above. These organizations will help identify and advise local community and labor organizations to help with recruitment, workforce training, and other support.

7. Increase energy resiliency in DACs.

Load growth from DERs like heat pumps will only grow over time. Accelerated adoption of these devices will further stress the existing T&D system and require upgrades. Increased demand for electricity may also put upward pressure on energy prices if electric supply cannot also increase in tandem with demand. It may be necessary to rely on less efficient, higher CO2 emitting power plants to meet the marginal demand created by more heat pumps.

This project will show how it is possible to electrify the building thermal sector while increasing customer and system reliability by creating virtual power plants with aggregated DERs controlled through a DER management system (DERMS). The goal of this project is to minimize the potential negative impacts of heating electrification on the reliability of the distribution system and avoid the need for building new infrastructure, while at the same time helping to accelerate the deployment of smart building solutions that will be critical in reducing GHG emissions.

The initial focus of the project team will be on LMI customers living in owner-occupied single-family homes in disadvantaged communities. The team will engage with low-income advocates in the energy space and Community Action Agencies to identify and recruit target customers. The project will use a community-based outreach model to engage LMI households both as customers and as workforce development participants. The Cape Light Compact's Cape and Vineyard Electrification Offering (CVEO) provides a rough template of how the offering and process could work. We believe it is critical to start with the LMI customer population which is too often left behind when new technology is being implemented.

8. Increase energy democracy in DACs.

As discussed above, partnerships with organizations like ABCD and MassCEC will advance opportunities for expanding participation in the energy transition. With their support we will communicate the opportunities and impacts of these public policy solutions while also listening to residents in the local communities to better understand their concerns and experience with the project. We will integrate local knowledge as we roll out the project over the 5-year term. Importantly, the low-income residents and communities served by this project will own the DERs and be empowered with knowledge regarding their benefits and how they work, leading to benefits and agency at the household level. These DERs will be aggregated to create virtual power plants in these LMI communities, which enables the collective management of load in such a way that may negate the need to build more power plants in their communities (where many of these power plants are often built.) By decentralizing we are creating community-wide relationships and democratizing energy by turning community members into prosumers with the knowledge of how energy is consumed in their homes, the impact of energy savings, the health benefits of having an energy efficient home, the benefits to the grid and the opportunity to provide input in the energy regulatory process.

MILESTONES

	Period 1	Period 2	Period 3	Period 4	Period 5
ABCD	Coordination with other Community Action Agencies, for targeted ESJ Communities.	Identification of potential operational synergies with the GRIP initiative.	Analysis of lessons learned in management of current EE programs.	Mitigation of barriers for Installation.	**Report |** Resource sharing with regional LIHEAP programs to identify eligible residents in LMI communities.
MassCEC	Partnership with Equity and Workforce Training Grantees in disadvantaged communities to develop training strategies, apprenticeship, and job opportunities.	Partnership with Minority and Women Owned Business Enterprises community-based organizations in disadvantaged communities to develop training strategies, apprenticeships and job opportunities	Partner with Empower to explore project to provide access to the benefits of heat pumps, batteries and smart thermostats in disadvantaged communities.	Development of resources to structure training and employment opportunities.	**Report |** Assessment of training and workforce engagement evaluation of those strategies in the ESJ communities.
IREC	Project discussion with Advisory Board meetings.	Outreach and educational materials for partners.	Development of community event focusing on recruiting WMBE contractors	Leverage existing tools and create a pipeline of workers.	**Report** Insights and recommendations to help develop and strengthen the program through its maturity.