

**Project Title:** Grid Visibility Program (GVP): Unlocking System-Wide Data to Build a More Resilient and Equitable Grid

**FOA Topic Area 2 - Smart Grid Grants**

**Project Location(s):** Allegheny County and Beaver County in Pennsylvania

**Bipartisan Infrastructure Law (BIL) Grid Resilience and Innovation Partnerships (GRIP)**

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## **1. Project Overview**

### **1.1. Background**

Duquesne Light Company (DLC) is proposing the Grid Visibility Program (GVP), or “the Project”, to deploy grid-enhancing technologies (GETs) that will increase capacity to reduce the need for clean energy curtailment, unlock additional clean energy generation, and enable more resilient grid operations, which are aligned with the Topic Area 2 objectives. By deploying GETs, DLC will implement an expedited, scalable, and affordable approach to meet these objectives while the grid transitions to a cleaner energy mix to meet decarbonization targets, such as those established in Pennsylvania’s Climate Action Plan<sup>1</sup>.

DLC, or “the Applicant”, is a mid-sized electric utility that has delivered safe and reliable electricity to customers in Allegheny and Beaver counties of Southwest Pennsylvania for over a century. Like much of the industry, DLC would benefit from enhanced visibility and the system intelligence necessary to fully understand and manage the mounting complexities from distributed energy resources (DERs), intermittency of renewables, and climate-related strain on its infrastructure. Some examples of these complexities include more frequent and severe weather patterns, distributed two-way power flow, increased load, and unpredictable usage patterns from electric vehicles (EV) and DERs.

According to the Grid Deployment Office’s (GDO) National Transmission Needs Study<sup>2</sup>, there is a pressing need for additional electric transmission infrastructure. GDO has determined that increasing interregional transmission provides the largest benefits and that needs will shift over time due to the clean energy transformation, evolving regional demand, and increasingly extreme weather events. By 2040 there is a significant need for new interregional transmission between nearly all regions.

At the edge, utilities have attempted to use advanced metering infrastructure (AMI) devices to collect and transmit large amounts of operational data to their back-office systems to perform analytics to varying degrees of success, due to limitations in their data collection and processing power. In addition, transporting, storing, and analyzing this data is costly and slow, limiting its operational value. Much more powerful grid edge data collection, processing and controls are needed to address emerging operational complexities, and to fully leverage EVs, DERs and flexible demand in real-time to make the grid more affordable and resilient.

The Project will bring cross-regional benefits to DLC’s service territory (Western Pennsylvania), Eastern Pennsylvania, and Ohio by increasing transmission capacity to allow for greater transfer of clean energy between the utilities that serve these regions. Regional resilience will be increased through the reduction of system constraints, increase in capacity, and insights gained

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<sup>1</sup>[https://files.dep.state.pa.us/Energy/Office%20of%20Energy%20and%20Technology/OETDPortalFiles/Climate%20Change%20Advisory%20Committee/2021/6-22-21/FINAL\\_DRAFT\\_PA\\_CAP\\_2021\\_June\\_16\\_2021.pdf](https://files.dep.state.pa.us/Energy/Office%20of%20Energy%20and%20Technology/OETDPortalFiles/Climate%20Change%20Advisory%20Committee/2021/6-22-21/FINAL_DRAFT_PA_CAP_2021_June_16_2021.pdf)

<sup>2</sup>[https://www.energy.gov/gdo/articles/draft-doe-study-identifies-pressing-national-electric-transmission-needs?utm\\_medium=email&utm\\_source=govdelivery](https://www.energy.gov/gdo/articles/draft-doe-study-identifies-pressing-national-electric-transmission-needs?utm_medium=email&utm_source=govdelivery)

at the grid-edge, leading to the system's ability to support a high DER penetration scenario and transfer more energy between the regions with less need for lengthy, costly transmission upgrades.

DLC has been collaborating with Utilidata and LineVision for over a year and established partnerships to deliver upon the scope outlined in this project. Utilidata and NVIDIA jointly developed the smart grid chip (SGC), which is proposed as part of this Project's deployment. SGCs are the industry's first scalable, distributed artificial intelligence (AI) platform, built to collect, and analyze high volumes of grid-edge data in real time. Utilidata is a leader in grid-edge software and real-time grid operations, and NVIDIA is a global leader in AI and accelerated computing. The SGC will provide an order-of-magnitude increase in edge computing power, enabling DER integration, enhanced planning and operations, and improved reliability and resilience. LineVision is also an established industry GET leader working with many of the largest utilities in the US and has successfully developed and deployed non-contact transmission line monitors<sup>3</sup> that securely measure and transmit data to advanced analytical tools that deliver real-time and forecasted dynamic line ratings (DLRs), while providing real-time awareness of conductors.

DLC, LineVision, and Utilidata have seen successes from other deployments and are well-prepared to continue scaling the proposed, commercially available technologies. United States Department of Energy (DOE) funding will help DLC significantly accelerate its work to date with these project partners.

## **1.2. Project Goal**

The Project team will deploy enhanced system visibility and coordination between the transmission and distribution (T&D) grid systems to enable more efficient use of DERs, while addressing inherent DER operational challenges. For example, DERs create uncoordinated bi-directional power flow and affect system voltages, which present challenges for electric grid operations. The Project can reduce, and potentially avoid, unnecessary capital expenditures, and customer service disruptions by mitigating voltage, current, frequency, and power stability issues. (b) (4)

[REDACTED]

The Project goals include increased capacity of transmission facilities, improved reliability and resiliency, prediction and prevention of system disturbances, ability to support increased integration of variable renewable energy sources throughout the T&D system, and integration and aggregation of DERs.

The Project will deploy, operationalize, and scale system awareness and the coordination of T&D devices, informed by SGCs at the distribution level and DLRs at the transmission level. This end-to-end situational awareness will provide energy transparency, enable energy resource optimization, and improve grid operations and integrated distribution planning (IDP). Energy

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<sup>3</sup> <https://www.power-grid.com/td/watch-dlc-expands-investment-in-dynamic-line-ratings/#gref>

transparency allows DLC to accurately plan, allocate, and report on the benefits to customers and regulatory entities. Energy resource optimization supports grid operations and planning by understanding and forecasting system needs and resource availability, allowing DLC to react appropriately to dynamic grid and weather conditions.

To accomplish these objectives, the Project Team proposes deploying the following technologies:

1. DLR sensors and software for transmission optimization
2. SGC for edge-data and distributed computational analysis and controls

These technologies will unlock additional transmission capacity to transfer clean energy to and from DLC's service territory (via DLR), while expediting interconnection processes and supporting bi-directional power flow from DERs (via SGCs), allowing for higher penetration of DERs. A Distributed Energy Resource Management System (DERMS) will be used to optimize and orchestrate communications and controls, via two-way long-term evolution (LTE) communications, between the SGC and DLR field sensors and utility back-office systems, enabling remote management, data-gathering, and optimization of grid devices.

In addition, the technologies will support the implementation of FERC Order 2222. The simultaneous deployment of these technologies will demonstrate the value of combined GETs to provide a pathway to a wider industry adoption, meeting the Topic 2 objectives outlined below:

Topic Area 2 Objectives	Proposed Project Ability to Meet Objective
Increase the capacity of transmission facilities or the capability of the transmission system to reliably transfer increased amounts of electric energy.	The DLR technology directly addresses this objective. DLC has previously implemented a limited deployment and has already realized the increased capacity benefits.
Prevent faults that may lead to wildfires or other system disturbances.	The real-time, actionable data coupled with remote communications and control and advanced machine learning (ML) capabilities provided by the DLR and SGC technologies allow DLC to prevent and mitigate system disturbances faster to improve system reliability and resilience.
Integrate variable renewable energy resources at the transmission and distribution levels.	DLR increases transmission capacity and SGC provides grid-edge/distribution visibility and control to support the increased integration of variable renewable energy resources.
Facilitate the aggregation and integration (edge-computing) of EVs and other grid-edge devices or electrified loads.	The SGC can be integrated with smart inverters/DERs/EVs to enable two-way communications and control to facilitate the aggregation and integration of grid-edge devices and electrified loads. In addition, SGCs provide real-time accounting capabilities into how DERs are performing for settlement needs. This will support FERC Order 2222 implementation, and will allow aggregators to increase their resource availability, which is currently discounted due to lack of real-time feedback/settlement.

**Project Locations**

(b) (4)

[REDACTED]

(b) (4)

[REDACTED]

**1.3. DOE Impact**

DOE funding will catalyze DLC's adoption of GETs to unlock significant public benefits.

First, funding will allow DLC to deploy both technologies faster and on a greater scale. (b) (4)

[REDACTED]

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<sup>4</sup> <https://screeningtool.geoplatform.gov/en/#3/33.47/-97.5>

Second, DOE funding will help DLC deploy these technologies in a more holistic, integrated manner, with significant additive benefits. The technologies deployed through this project will be integrated with DLC's DERMS and two-way communications system currently under development. The more rapid deployments will allow for accelerated adoption of clean energy, and associated greenhouse gas (GHG) reductions, at both the transmission and distribution level. The broader geographic coverage of the GVP deployment will improve the resilience and affordable operation of the regional electric grid. DOE funding will allow DLC to devote more resources to community engagement, support energy equity benefits, and align with Justice40 initiatives. Funding will also allow DLC to promote this investment in the GVP as a model for other utilities to adopt, an approach that has been validated by multiple studies.<sup>5</sup>

Finally, DOE funding will help DLC avoid the type of under-investments that typically slow grid modernization efforts and increase the risk of stranded assets. Software-defined solutions like distributed AI require a significant upfront investment in data capture and computing power. This can be challenging for utilities and state regulators to justify, particularly because all the use cases for this computing power have not yet been discovered, and AI models take time to develop. DOE funding will allow DLC to demonstrate the full value of distributed AI to the industry, which is expected to spur significant private capital into this space and chart a path for other utilities to invest without DOE funding.

With respect to regulatory matters, DLC's transmission operations are subject to Federal Energy Regulatory Commission jurisdiction, and its distribution operations are subject to Pennsylvania Public Utility Commission jurisdiction. DOE Funding helps DLC align with policy objectives in both state and federal jurisdictions. DLC has engaged its regulators in discussions regarding this project and will continue to closely collaborate with them during the project.

#### **1.4. Community Benefits Plan: Job Quality and Equity**

Some items from the Community Benefits Plan (CBP) are summarized in this section. For additional details, please refer to the CBP document submitted as part of this application.

##### **1.4.1. Benefits to the Local Community and Disadvantaged Communities**

The proposed project expects to attain progress towards the following GRIP goals. Details of the projected benefits to DACs and the local communities can be found in the CBP.

- A Decrease in Energy Burden
- An Increase in High-Quality Job Creation, the Clean Energy Job Pipeline, and Job Training
- Increased Parity in Clean Energy Technology Access and Adoption
- An Increase in Energy Resilience Including Reduced Outage Frequency and/or Duration.
- Decrease in Environmental Exposure and Burdens
- Support Increase in Low-Cost Capital
- Increases in Clean Energy Enterprise Creation and Contracting
- Increases in Energy Democracy, Including Community Ownership

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<sup>5</sup> U.S. Department of Energy. "Grid-Enhancing Technologies: A Case Study on Ratepayer Impact." February 2022.



#### **1.4.2. Plan to Attract, Train, and Retain a Skilled Labor Workforce**

(b) (4)

[REDACTED]

#### **1.4.3. Long-Term Constraints on Natural Resources**

The proposed project does not have any identified long-term constraints on natural resources. The project proposes an accelerated strategy to improve the health and safety in the impacted communities. To achieve this, GETs will be used to support adoption of clean energy resources, secure systems, system reliability, and resiliency. The project scope involves deploying sensing devices at transmission lines and at the grid-edge, which will not burden the communities with cleanup costs and waste. The CBP outlines how the project meets the GRIP program goals of community and labor engagement, investing in American workforce, advancing Diversity, Equity, Inclusion and Accessibility (DEIA), and Justice40 goals.

#### **1.4.4. Climate Resilience Strategy**

DLC serves a region that experiences frequent and multiple extreme weather patterns, including floods, landslides, winter storms, extreme cold, lightning strikes, extreme heat, and windstorms. The DLR and SGC technologies strongly support DLC's climate resiliency strategy by providing more accurate and real-time visibility into grid conditions and enabling operational teams to better plan and react more quickly to extreme weather conditions or other emergency events.

The SGC is expected to improve DLC's ability to detect potential operational problems and reduce unplanned outage times. By 2028, the SGC will enable the development of AI models that can predict pre-outage conditions or pending equipment failure. The local AI models can then further enhance resiliency by enabling autonomous microgrids that coordinate local resources when the grid is under stress. [Additionally, DLC has limited hosting capacity data, which adds to the difficulty of interconnecting DERs that could aid in the grid's reliability and resilience needs. The SGC aims to speed DLC's interconnection times in participating GVP communities by 25% by 2028.] The SGC also enhances DLC's ability to tap into flexible demand and DERs as a grid resource, which could greatly strengthen resilience. Managing weather extremes often means managing scarce generation resources, as recently experienced in California and Texas. Under those circumstances, maximizing the utilization of available resources from the transmission system to distribution-connected and customer-sited resources can be essential to maintaining electric service.

At the transmission level, DLR dynamically adjusts the transmission capacity of power lines based on real-time weather data, providing the capability to increase transmission capacity in real-time. DLR also supports integration of renewable energy sources, such as wind and solar power, to the grid by providing the ability to dynamically adjust the transmission line capacity to accommodate fluctuations in renewable energy production. DLR sensors evaluate conductor health and detect adverse phenomenon like galloping, conductor creep, excessive sag, blowout, conductor fatigue, ice accretion, and wildfires. Finally, reliable hour- and day-ahead forecasting provided by DLC can

provide emergency rating for all remaining in-service lines, helping DLC execute alternative transmission paths around damaged portions of the grid.<sup>6</sup>

These new capabilities provided by GETs align with and support DLC's and Pennsylvania's state, regional and local climate change, and resiliency strategies:

1. The technologies proposed in this project help support or enhance robustness, redundancy, and rapid detection/recovery outlined by the DOE State Energy Security Plan<sup>7</sup>. The Plan specifically recognizes that as energy demand shifts, new challenges will arise, and it is essential to ensure reliable energy delivery to Pennsylvania customers through resilience and hardening measures.<sup>8</sup>
2. The Pennsylvania Emergency Management Agency (PEMA) produces a Hazard Mitigation Plan<sup>9</sup> for the Commonwealth of Pennsylvania every 5 years. Utility interruption is identified as a risk that this Project would help mitigate.
3. Per the Pennsylvania Climate Action Plan<sup>10</sup> (2021), Pennsylvania is promoting the use of clean energy to achieve a 26% reduction of GHG emissions from 2005 levels by 2025. In addition, Pennsylvania's Pathway to 2050 sets a target of reducing GHG emissions across sectors by 80% below 2005 levels by 2050. One of the core strategies for achieving these goals is clean electricity generation, which this Project will promote through better clean energy integration at both the transmission and distribution level.
4. The City of Pittsburgh developed a comprehensive Climate Action Plan to meet the state's GHG reduction target, while also improving resiliency, increasing innovation, and promoting workforce development.<sup>11</sup> This Project will empower communities in the Pittsburgh area to meet these goals by integrating DERs more quickly and affordably; enabling more flexible demand; improving reliability and resiliency; and expanding workforce development pipelines with the University of Pittsburgh and Pittsburgh Gateways Corporation.

## **2. Technical Description, Innovation, and Impact**

### **2.1. Relevance and Outcomes**

GVP proposes implementing DLRs at transmission lines and SGCs at customer metering points, enabled by remote two-way communications, and facilitated by DLC's DERMS. This project, and its technology, proposes strong community benefits and will act as a catalyst for the industry to implement similar projects with a high level of community engagement.

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<sup>6</sup> [https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jul/IRENA\\_Dynamic\\_line\\_rating\\_2020.pdf?la=en&hash=A8129CE4C516895E7749FD495C32C8B818112D7C](https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jul/IRENA_Dynamic_line_rating_2020.pdf?la=en&hash=A8129CE4C516895E7749FD495C32C8B818112D7C)

<sup>7</sup> [https://www.energy.gov/sites/default/files/2022-06/DOE%20CESER%20SESP%20Drop-in\\_Risk%20Mitigation%20Measures\\_FINAL\\_508.pdf](https://www.energy.gov/sites/default/files/2022-06/DOE%20CESER%20SESP%20Drop-in_Risk%20Mitigation%20Measures_FINAL_508.pdf)

<sup>8</sup> Pennsylvania State Energy Security Plan

<sup>9</sup> <https://www.pema.pa.gov/Mitigation/Planning/State-Hazard-Mitigation-Plan/2018/Pages/default.aspx>

<sup>10</sup> <http://www.depgreenport.state.pa.us/elibrary/GetDocument?docId=3925177&DocName=2021%20PENNSYLVANIA%20CLIMATE%20ACTION%20PLAN.PDF%20%20%3cspan%20style%3D%22color:green%3b%22%3e%3c%20%3cspan%20style%3D%22color:blue%3b%22%3e%28NEW%29%3c%20%3e%209%2F%2021%2F%2023>

<sup>11</sup> City of Pittsburgh Climate Action Plan 3.0

### **2.1.1 Dynamic Line Rating (DLR) by LineVision, Inc.**

DLC will partner with LineVision to deploy DLR sensors and software (b) (4) within DLC's service territory, scaling the benefits already delivered from an initial deployment that began in the summer of 2021.

LineVision has developed non-contact transmission line monitors that measure and securely transmit data to advanced analytical tools to deliver real-time and forecasted DLRs, while also providing real-time awareness of conductors. LineVision uses computational fluid dynamics (CFD) to model the cooling effect of wind on each span based on elevation changes, vegetation, and other local features. Scanning optical light detection and ranging (LiDAR) sensors are installed on towers at strategic locations to continuously measure the position and sag of the conductor. This information is combined with atmospheric weather information, line loading, and conductor properties to train the CFD model and produce a highly accurate wind speed for each span, affecting temperature on the line. This allows LineVision to provide DLC with updated capacity on lines based on actual temperatures, which are a load controlling factor. DLC can then deliver a dynamic rating that, for most of the time<sup>12</sup>, is above the static rating, giving operators the ability to increase the amperage of the line. DLR unlocks additional capacity on the grid, directly reducing congestion and distributed generation challenges.

(b) (4) ] On one transmission line, DLC has identified an average of 25% additional available capacity on the transmission line equipped with the technology, making it easier to expand the integration of renewable energy and meet the region's future demand for electricity. Through real-time visibility of line congestion and conditions (e.g., icing detection), DLC can determine when maintenance is required to further increase service reliability and prevent system disturbances.

Due to the initial success of the DLR program, DLC is proposing with this project to expand the DLR technology to an additional seven transmission lines. DLC has demonstrated that integration of real-time and forecasted DLR with system operations can reduce congestion and thereby support the economic viability of more renewable generation projects. This value can be further enhanced with a holistic approach that complements DLR by creating a bidirectional pathway to customers at the grid-edge, allowing maximized transmission to be supported by distribution system and grid-edge flexibility through the SGCs. The DLR deployment and technology aligns with job training, increased parity in clean energy technologies, and partnering with union labor. Additional details can be found in the CBP.

### **2.1.2 Smart Grid Chip (SGC) by Utilidata (partnered with NVIDIA)**

DLC proposes advancing grid-edge visibility and controls through Utilidata's SGC distributed AI platform. The SGC is an open, scalable platform for distributed grid operations that is installed via a standard meter collar between the customer meter and the meter socket.

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<sup>12</sup> (b) (4) ]

The SGC is built on the NVIDIA Jetson processor with a central processing unit (CPU) and graphics processing unit (GPU). The GPU is more efficient at computing matrices, the key piece of math for an AI-driven grid. The SGC will be equipped with Utilidata’s real-time data processing and grid operational software, NVIDIA’s AI tools, and a secure third-party application environment. The SGC has remote two-way communications capabilities and is designed for security and interoperability. Once connected, the SGC collects, analyzes, and can share real-time, actionable data to the utility, customers, and other authorized parties. The SGC is a software-defined solution that allows new applications to be developed and remotely loaded. Therefore, the SGCs have the potential to tackle emerging and operational challenges without the need for infrastructure upgrades or a field visit. For the purposes of this project, the team will focus on the edge visibility, optimization, and enhanced resilience.

2.1.3 Technology Integration

(b) (4)

2.2. Feasibility

In 2021, DLC teamed with LineVision to commence a pilot. In 2022, the lessons-learned and realized benefits informed the decision to operationalize and expand the DLR program. (b) (4)

(b) (4)

Similarly, Utilidata deployed SGCs, in the field, in New York and Michigan in 2022 which validated the SGCs' capability to accurately collect and locally analyze measurements and stream data to the cloud to achieve the operational goals of the Project. (b) (4)

The SGC technology is informed by Utilidata's grid edge advisory board that includes DLC, American Electric Power (AEP), Pennsylvania Power and Light (PPL), Portland General Electric (PGE), Southern California Edison (SCE), Consumers Energy, Holy Cross Energy, Sunrun, and General Motors (GM). The SGCs' NVIDIA chips and standard software packages are scalable, secure, and utilized by more than three million developers.<sup>14</sup> The SGC hardware is a modified version of an industry standard meter adapter that has been deployed at scale in the industry for decades (b) (4)

### 2.3. Innovation and Impacts

(b) (4)

AMI meters have relatively limited processing power for grid operational use cases and cannot execute distributed AI. In contrast, the SGC is a native AI platform, with well over 100x more processing power than the highest-end smart meter available today.<sup>15</sup> The SGC is built to provide real-time operational visibility, dynamic grid edge operations, DER integration and resiliency. The processing power of the SGC will allow utilities to tackle emerging challenges with AI models and software upgrades, giving the grid unprecedented flexibility.

Most transmission lines are underutilized due to conservative assumptions for worst-case scenarios. Traditionally, this has been the basis for transmission line rating calculations. Line rating calculations, based on static or seasonal ambient assumptions, often result in unnecessary restrictions in operation of transmission lines and may lead to additional congestion costs. DLR allows for dynamic line rating calculations, based on actual field data, that can be used to reduce congestion, prevent curtailment, and unlock additional line capacity, which would have otherwise been unknown to exist.

With the DOE's funding and support, the Project will evaluate these technologies both in a standalone context and as part of an integrated, interactive, operational system. If successful, these technologies will bring end-to-end visibility and the necessary control to operate a clean,

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<sup>13</sup> <https://www.power-grid.com/td/watch-dlc-expands-investment-in-dynamic-line-ratings/#gref>

<sup>14</sup> [https://images.nvidia.com/nvimages/gtc/pdf/NVIDIA\\_GTC2022\\_Fall\\_Highlights.pdf](https://images.nvidia.com/nvimages/gtc/pdf/NVIDIA_GTC2022_Fall_Highlights.pdf)

<sup>15</sup> Analysis of NVIDIA Jetson processor versus major metering company platforms available today

resilient, and reliable electric grid. This will also provide a roadmap for other utilities to pursue similar technologies and methodologies. DLC's Community Partnerships, outlined in the CBP, will help ensure that this project provides regional learnings and benefits.

DLC's reputation for successful, hands-on innovation will generate confidence for other utilities to deploy these technologies. In turn, increased market demand will allow DLC's technology partners to expand the scale of their operations, generating unit price reductions, leading to greater benefits for their utility customers. A successful project will also attract additional private capital to support these technologies. For example, once first movers demonstrate success in this market, NVIDIA plans to invest substantial resources into distributed AI for the utility industry, including co-designing with Utilidata a customized chip for the electric grid that will drive the same outcomes at a lower cost.

### **3. Workplan**

#### **3.1. Project Objectives**

DLC will implement GETs to support the grid transition to a cleaner, more distributed energy mix to meet decarbonization targets, such as those established in the State of Pennsylvania's Climate Action Plan. Through this approach, the Applicant will be capable of making a significant contribution towards attaining Pennsylvania's goal of achieving an 80 percent GHG emission reduction. DLR supports clean energy goals by allowing transmission lines to safely transmit more electricity by providing the capability to dynamically adjust line capacity and prevent constraints. SGC provides faster interconnection processes and accelerated DER adoption, optimized DER performance, and improved reliability and resiliency.

[(b) (4)]

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

#### **3.2. Buy America Requirements for Infrastructure Projects**

While the Project will involve the construction, alteration, and/or repair of infrastructure in the United States, DLC is a for-profit investor-owned utility (IOU). As such, pursuant to Office of Management and Budget (OMB) Memorandum M-22-11, Buy America Requirements are not applicable to this project. See also FOA Appendix C. However, DLC and its contractors are making efforts to source domestically. Utilidata assembles the SGC in Ann Arbor, Michigan, using multiple domestic-made components, including meter collar enclosures, metrology printed circuit boards, carrier boards, current transformers, wiring kits, and software. [(b) (4)]

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(b) (4)

### **3.3. Technical Scope Summary**

- Budget Period 1 (BP1) – Month 1 to Month 12: Planning, Feasibility Confirmation, Project & Organizational Preparation, Design, Use Cases, Deployment Phase 1 Expansion - BP1 is focused on baselining the plan for the project, confirming feasibility, use cases, prepare the organization for the expanded deployment, and the Community Engagement SMART goal.
- Budget Period 2 (BP2) – Month 13 to Month 24: Phase 2 Expansion, Cybersecurity, Community Engagement, Deployment Phase 2 Expansion - BP2 is focused on expanding the deployment and the Investing in the American Workforce and DEIA SMART goal.
- Budget Period 3 (BP3) – Month 25 to Month 36: Deployment Phase 3 Expansion, Checkpoint, Cybersecurity Re-assessment, and Community Update – BP3 is focused on expanding the deployment and the Increased Parity in Clean Energy Technology Access and Adoption SMART goal.
- Budget Period 4 (BP4) – Month 37 to Month 48: Deployment Phase 4 Expansion, Checkpoint, Cybersecurity Re-assessment, and Community Update – BP4 is focused on expanding the deployment and the Energy Resilience SMART goal.
- Budget Period 5 (BP5) – Month 49 to Month 60: Deployment Phase 5 Expansion, Checkpoint, Cybersecurity Re-assessment, Community Update, and Final Report - BP5 is focused on finalizing the deployment, gathering data, and reporting on the project learnings, recommendations, community benefits, and completion of SMART goals.

### **3.4. Work Breakdown Structure (WBS) and Task Description Summary**

Included below is the WBS and a summary of the tasks. Additional details can be found in the Statement of Project Objectives (SOPO).

- Task 1.0: Project Management and Planning: These tasks are focused on initiating and planning the project, which will set the foundation for future project activities.
  - Subtask 1.1: Project Management Plan (PMP), Subtask 1.2: National Environmental Policy Act (NEPA) Compliance, Subtask 1.3: Cybersecurity Plan (CSP), Subtask 1.4: Continuation Briefing(s)
- Task 2.0: Feasibility, Project & Organizational Preparation and Design, and Use Cases: These tasks are focused on preparing the organization for the deployment, designing the system, and developing the technical use cases.
  - Subtask 2.1: Feasibility Confirmation, Subtask 2.2: SGC Project and Organizational Preparation, Subtask 2.3: System Design, Subtask 2.4: Develop SGC Use Cases
- Task 3.0: Phase 1 Expansion: This task is focused on deployment and establishing the Community Workforce Coalition (CWC).
  - Subtask 3.1: DLR Deployment Expansion, Subtask 3.2: SGC Deployment Expansion, Subtask 3.3: Establish CWC
- Task 4.0: Cybersecurity: This task is focused on performing a cybersecurity evaluation of the system.
  - Subtask 4.1: Cybersecurity Evaluation

- Task 5.0: Community Benefits & Engagement: This task is focused on continuing the engagement with the community.
  - Subtask 5.1: Community Benefits Confirmation & Engagement
- Task 6.0: Phase 2 Expansion: This task is strictly focused on field deployment.
  - Subtask 6.1: DLR Deployment Expansion, Subtask 6.2: SGC Deployment Expansion
- Task 7.0: Phase 3 Expansion: This task is strictly focused on field deployment.
  - Subtask 7.1: DLR Deployment Expansion, Subtask 7.2: SGC Deployment Expansion
- Task 8.0: Checkpoint: This task is focused on re-assessing the security of the system and continuing community engagement.
  - Subtask 8.1: Cybersecurity Reassessment, Subtask 8.2: Community Benefit Quantification & Update
- Task 9.0: Phase 4 Expansion: This task is strictly focused on field deployment.
  - Subtask 9.1: SGC Deployment Expansion
- Task 10.0: Checkpoint: This task is focused on re-assessing the security of the system and continuing community engagement.
  - Subtask 10.1: Cybersecurity Reassessment, Subtask 10.2: Community Benefit Quantification & Update
- Task 11.0: Phase 5 Expansion: This task is strictly focused on deployment of software enhancements.
  - Subtask 11.1: SGC Software Updates
- Task 12.0: Checkpoint: This task is focused on re-assessing the security of the system and continuing community engagement.
  - Subtask 12.1: Cybersecurity Reassessment, Subtask 12.2: Community Benefit Quantification & Update
- Task 13.0: Final Report: This task is focused on gathering all the data from the project and developing a comprehensive report for the DOE.
  - Subtask 13.2: Potential Improvements and Recommendations to Industry, Subtask 13.3: Final Report

### **3.5. Milestone Summary**

- Milestone 3.3.1: Finalization of the participants in the CWC and conduct first listening tour.
- Milestone 5.1.1: Conduct one CWC listening session per budget period to report out on SMART goals and continue to collect feedback to inform necessary CBP revisions; In collaboration with Pitt, develop new course modules to support the GVP.
- Milestone 8.2.1: Conduct one CWC listening session per budget period to report out on SMART goals and continue to collect feedback to inform necessary CBP revisions; develop and implement new strategies to attract talent from DACs and underrepresented groups for GVP workforce development/employment opportunities; demonstrate hosting capacity can be calculated on-demand using data driven models of DER actions and responses to control signals; determine highest priority voltage violations to mediate in GVP communities based on SGC data
- Milestone 10.2.1: Conduct one CWC listening session per budget period to report out on SMART goals and continue to collect feedback to inform necessary CBP revisions;



demonstrate that DLC's interconnection study process timelines can be reduced in GVP communities with SGCs using real-time hosting capacity matrices.

- Milestone 12.2.1: Conduct one CWC listening session per budget period to report out on SMART goals; reduce DLC's internal interconnection processing time by 25%; reduce voltage violations by at least 5% through system repair or optimization of local resources (such as DERs, controllers, and/or loads).

### 3.6. Go/No-Go Decision Points

- Go/No-Go Decision Point 1: Demonstrate the project feasibility, use cases, compliance, PMP, CSP, CWC, and Phase 1 deployment.
- Go/No-Go Decision Point 2: Demonstrate the community benefits, organizational readiness, and security of the system through achievement of BP2 tasks and milestones.
- Go/No-Go Decision Point 3: Demonstrate the progress made towards deployment, and cybersecurity through achievement of BP 3 milestones as listed above. The completion of BP 3 should increase confidence to continue the deployment.
- Go/No-Go Decision Point 4: Demonstrate the progress made towards deployment, and cybersecurity through achievement of BP 5 milestones as listed above. The completion of BP 3 should increase confidence to continue the deployment.

### 3.7. End of Project Goal

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### 3.8. Project Schedule

Table 2 is a preliminary project schedule. If necessary, the project schedule will be refined as the project progresses.

*Table 2: Project Schedule*

Task	Subtask	BP1 (Q1-Q4)	BP2 (Q5-Q8)	BP3 (Q9-Q12)	BP4 (Q13-Q16)	BP5 (Q17-Q20)
Task 1.	Subtask 1.1 – Project Management Plan (PMP)					
	Subtask 1.2: National Environmental Policy Act (NEPA) Compliance					
	Subtask 1.3: Cybersecurity Plan (CSP)					
	Subtask 1.4: Continuation Briefing(s)					
Task 2.	Subtask 2.1: Feasibility Confirmation					

*May contain trade secrets or commercial or financial information that is privileged or confidential and exempt from public disclosure.*

	Subtask 2.2: SGC Project and Organizational Preparation					
	Subtask 2.3: System Design					
	Subtask 2.4: Develop SGC Use Cases					
<b>Task 3.</b>	Subtask 3.1: DLR Deployment Expansion					
	Subtask 3.2: SGC Deployment Expansion					
	Subtask 3.3: Community Workforce Coalition (CWC)					
<b>Task 4.</b>	Subtask 4.1: Cybersecurity Evaluation					
<b>Task 5.</b>	Subtask 5.1: Community Benefits Confirmation & Engagement -					
<b>Task 6.</b>	Subtask 6.1: DLR Deployment Expansion					
	Subtask 6.2: SGC Deployment Expansion					
<b>Task 7.</b>	Subtask 7.1: DLR Deployment Expansion					
	Subtask 7.2: SGC Deployment Expansion					
<b>Task 8.</b>	Subtask 8.1: Cybersecurity Reassessment					
	Subtask 8.2: Community Benefit Quantification & Update					
<b>Task 9.</b>	Subtask 9.1: SGC Deployment Expansion					
<b>Task 10.</b>	Subtask 10.1: Cybersecurity Reassessment					

	Subtask 10.2: Community Benefit Quantification & Update					
<b>Task 11.</b>	Subtask 11.1: SGC Software Updates					
<b>Task 12.</b>	Subtask 12.1: Cybersecurity Reassessment					
	Subtask 12.2: Community Benefit Quantification & Update					
<b>Task 13.</b>	Subtask 13.2: Potential Improvements and Recommendations to Industry					
	Subtask 13.3: Final Report					

### 3.9. Project Management

#### 3.9.1. Organization and Approach to Managing the Work

The management approach will follow the Project Management Institute's (PMI) industry-standard Project Management Life Cycle<sup>16</sup> and practices, while fostering collaboration across the stakeholders to surface areas of misalignment, maintain open communication & knowledge sharing across the teams, and delivery of a quality end-to-end solution that satisfies business needs and provides customer value.

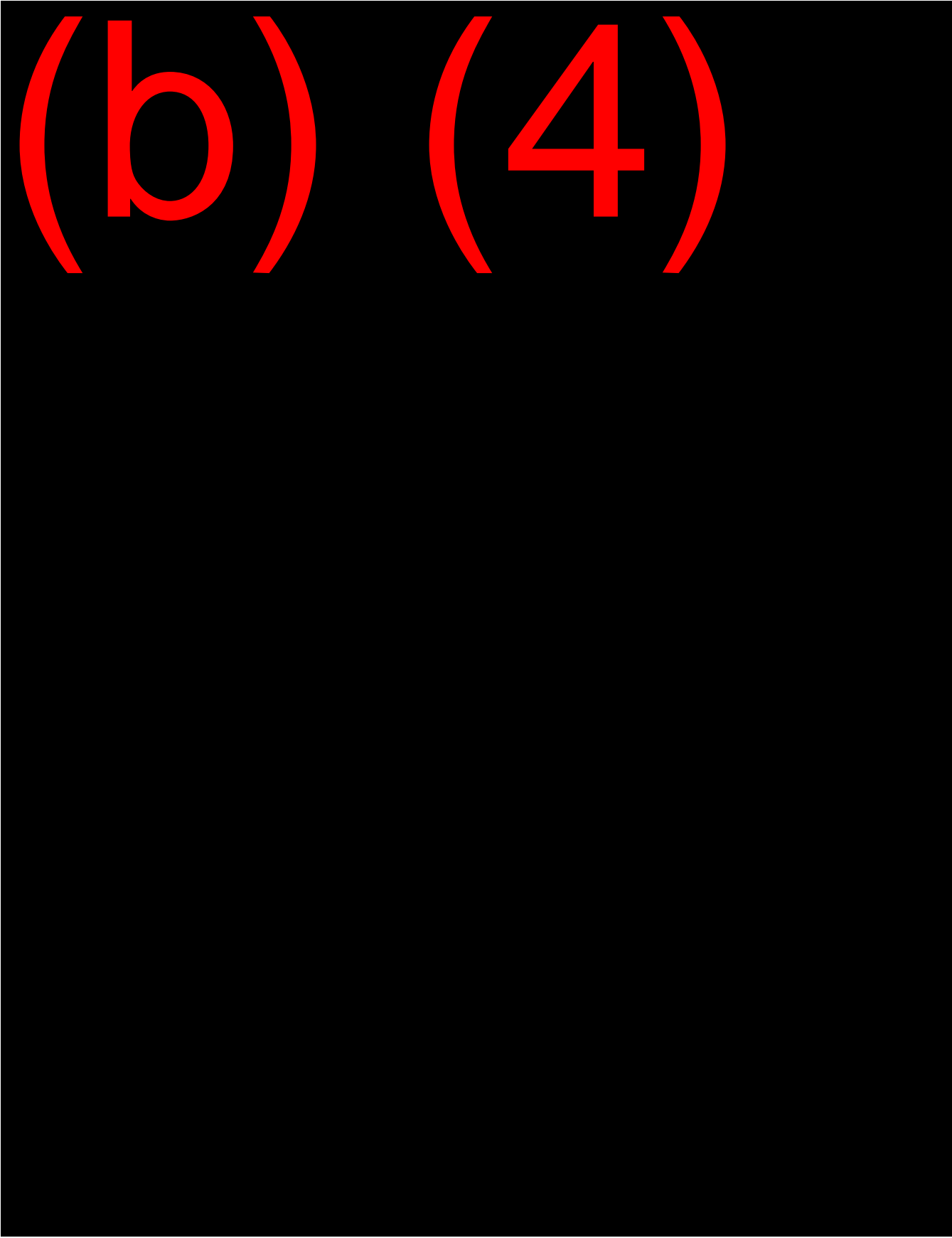
DLC has a well-established, mature Project Management Manual that addresses the purpose, scope, project management lifecycle, and organizational roles and responsibilities. In addition, DLC follows a well-documented project approval process where projects are identified, scored, and presented to the appropriate governing body for approval. DLC's standard PMP includes scope basis, assumptions, risk register, lessons-learned, cost estimates, schedule, work breakdown structure, engineering design, procurement, and supply chain. Additional details of this document and the process can be shared with the DOE upon request.

#### 3.9.2. Roles of Project Team Members

Table 3 outlines the roles, team members, associated organizations, and estimated time commitments. The project team's resource time commitments will be allocated appropriately, and as necessary, to meet the project objectives. Additional details can be found in the Budget Workbook submitted as part of this application.

<sup>16</sup> <https://www.pmi.org/about/learn-about-pmi/project-management-lifecycle>

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### **3.9.3. Critical Handoffs/Interdependencies among Project Team Members**

Critical handoffs and interdependencies will be outlined in a project plan and communicated with all Project Team members on a regular basis. The process will be reiterated at the onset of the project. Emails, meeting, status reports, and centralized document repositories will be used for version and access control to documentation and file transfers.

### **3.9.4. Technical and Management Aspects of the Management Plan**

The Technical and Management aspects of the Project will be outlined in the PMP. DLC will manage the project according to DLC's established project management methodology and framework. DLC's processes, procedures, tools, and templates will be applied where applicable.

In addition, DLC's established cybersecurity standards, practices, and procedures will be followed. DLC's cybersecurity governance includes practices that address Supply Chain Risk, Risk Assessment, System Security Management, Patch Management, System Access Control, Incident Response, Vulnerability Assessment, Training, Physical Security, Access Management and Revocation, Change Control, and Configuration Management.

### **3.9.5. Approach to Project Risk Management and Handling Project Changes**

Risk management and project changes will be managed and tracked via a risk and change log. On a regular basis, the project team will meet to discuss potential risks and changes.

The following defines the steps in the Risk Management Cycle:

- **Identify Risks:** The first step is to identify all the potential risks that could impact the project and prioritize them based on their likelihood and impact.
- **Analyze Risks:** Evaluate the risks to understand their impact & likelihood and assess their consequences.
- **Plan Response:** Develop a plan for how to respond to each risk, including risk avoidance, transfer, mitigation, or acceptance.
- **Implement Response:** Put the risk response plan into action by implementing the agreed-upon response strategies.
- **Monitor and Control Risks:** Regularly monitor the identified risks and update the risk management plan as necessary.

Both risk management and change management will require ongoing monitoring and updating to ensure the project stays on track and is successful.

**3.9.6. Approach to Quality Assurance/Control**

DLC and the project team will follow their respective organizations' quality assurance/control policies and procedures to manufacture their hardware, test the hardware, design, test, integrate, and implement the system for the project.

**3.9.7. Project Team Members Communications**

Effective communication among project team members is crucial to the success of any project. This will be achieved through multiple channels, including in-person meetings, email, video conferencing, instant messaging, project management software, centralized document repository, phone calls, text messages, and project status reports. It is important to establish clear communication protocols and ensure all team members understand their roles and responsibilities in terms of sharing information and updates. Regular check-ins and team meetings can help maintain transparency and accountability and foster a sense of collaboration and teamwork.

**4. Technical Qualifications and Resources**

**4.1. Project Team Qualifications and Expertise**

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

#### **4.2. Existing Facilities and Equipment**

DLC and the project team partners have adequate access to the necessary equipment and facilities to accomplish the proposed project. DLC is an electric utility with ownership of the T&D infrastructure and facilities for which the DLR and SGC equipment will be installed. All components required for the LineVision DLR components are the same products that were used in previous projects. LineVision and Utilidata have solid relationships with suppliers and contract manufacturers and will be able to source the necessary parts within a feasible amount of time.

Utilidata procures prepopulated circuit board modules and has established relationships with the manufacturers of the communications module. For electronics assembly, Utilidata is working with a Michigan-based electronics components assembler with more than 40 years of experience. All assembled electronics are tested before they are shipped to the hardware assembler. For hardware assembly, Utilidata has contracted with a Michigan-based assembler Brooks Utility Products with a 140-year history in manufacturing and assembly of hardened electrical utility-grade devices. Brooks' products are engineered to meet or exceed American National Standards Institute (ANSI) standards and their facility is International Organization for Standardization (ISO) 9001 certified.



#### **4.3. Relevant Prior Work**

DLC and the project team have in-depth prior experience with tasks of similar risk and complexity.

Between 2011 and 2021, DLC invested more than \$3.1 billion in infrastructure and technology upgrades, including ongoing investment in innovative technologies and critical infrastructure to modernize and improve the resiliency of the electrical grid, and to advance a clean and equitable energy future for the Pittsburgh region. DLC has extensive resources and experience with deploying highly complex capital projects with various contractors and subcontractors. DLC has worked with both LineVision and Utilidata previously on successful projects. In addition, the DLC team has experience with several DOE projects.

LineVision is the leader in DLR technology and has deployed projects with six of the top ten utilities in the United States.<sup>17</sup> Utilities like National Grid have already moved forward with operationalizing LineVision DLR at scale, so LineVision has gained extensive experience in implementing projects that are nearly identical in terms of risk and complexity, and in the process have significantly de-risked the process of implementing DLR.

LineVision and DLC have worked together on prior DLR projects, first completing a demonstration project in 2021 and currently completing a fully operationalized expansion project. The proposed project will primarily consist of 1) hardware installations at selected locations; 2) training of the DLR models for each line; and 3) ingesting the DLR ratings into DLC's Energy Management System (EMS). Each of these steps has been completed previously and can be easily replicated. DLC personnel is already well-versed in the hardware installation process having completed several of them as part of the previous projects. Each new sensor can be installed in less than an hour using simple hand tools.

The SGC was developed leveraging the experience of Utilidata and NVIDIA. For over a decade, Utilidata has used a centralized software platform to execute real-time, data-driven grid operations using machine learning. This software is scaled with major utilities and proven to deliver three percent energy savings and help integrate renewable energy.

NVIDIA has industry-leading experience developing AI-powered chips and bringing such technology to scale in new markets, such as gaming, autonomous driving, healthcare, and robotics. The SGC is designed to provide easy data access to third parties and provide support for innovation ecosystems.

Utilidata and DLC have already worked together to demonstrate some of these capabilities and are building upon the initial exercise to provide a full meter-to-secondary-transformer connectivity model. This will provide the basis for a data-driven power flow model using grid-edge data.

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<sup>17</sup> Measured by number of customers. The utilities include Dominion, Exelon, National Grid, New York Power Authority (NYPA), and Xcel.