Other Attachment File(s)

*** Mandatory Other Attachment Filename:** 1235-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

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: TA2-149-E

5b. Federal Award Identifier:

State Use Only:

6. Date Received by State:

7. State Application Identifier:

8. APPLICANT INFORMATION:

* a. Legal Name: Virginia Electric and Power Company

* b. Employer/Taxpayer Identification Number (EIN/TIN): 54-0418825

* c. UEI: SZ2DG8WLKRG3

d. Address:

* Street1: 120 Tredegar Street
Street2:
* City: Richmond
County/Parish:
* State: VA: Virginia
Province:
* Country: USA: UNITED STATES
* Zip / Postal Code: 23219-4306

e. Organizational Unit:

Department Name: Power Delivery

Division Name: Transmission; Grid & Tech Solu

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

Prefix:
* First Name: Heather
Middle Name:
* Last Name: Eades
Suffix:

Title: Energy Market Strategic Advisor

Organizational Affiliation: Dominion Energy Services, Inc.

* Telephone Number: 804.385.4122
Fax Number:

* Email: heather.eades@dominionenergy.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:**

Dominion Energy Virginia | Analytics and Control for Driving Capital Efficiency Project

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: VA-04 * b. Program/Project: VA-001

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

1234-Congressional Districts.docx | 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	33,654,095.00
* b. Applicant	33,654,095.00
* c. State	0.00
* d. Local	0.00
* e. Other	0.00
* f. Program Income	0.00
* g. TOTAL	67,308,190.00

*** 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: Amanda

Middle Name:

* Last Name: Prestage

Suffix:

* Title: General Manager - Corp Strategic Planning

* Telephone Number: 804.771.4416 Fax Number:

* Email: amanda.k.prestage@dominionenergy.com

* Signature of Authorized Representative: Amanda Prestage * 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. DE-FOA-0002740	81.254	$	$	$ 12,596,000.00	$ 12,596,000.00	$ 25,192,000.00
2.						
3.						
4.						
5. Totals		$	$	$ 12,596,000.00	$ 12,596,000.00	$ 25,192,000.00

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY (1)	(2)	(3)	(4)	Total (5)
	DE-FOA-0002740				
a. Personnel	$ 15,733,900.00	$	$	$	$ 15,733,900.00
b. Fringe Benefits	0.00				0.00
c. Travel	0.00				0.00
d. Equipment	16,476,000.00				16,476,000.00
e. Supplies	15,000.00				15,000.00
f. Contractual	31,380,000.00				31,380,000.00
g. Construction	2,383,290.00				2,383,290.00
h. Other	1,320,000.00				1,320,000.00
i. Total Direct Charges (sum of 6a-6h)	67,308,190.00				$ 67,308,190.00
j. Indirect Charges					$
k. TOTALS (sum of 6i and 6j)	$ 67,308,190.00	$	$	$	$ 67,308,190.00
7. Program Income	$	$	$	$	$

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Prescribed by OMB (Circular A -102) Page 1A

SECTION C - NON-FEDERAL RESOURCES

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e)TOTALS
8. DE-FOA-0002740	$ 33,654,095.00	$ 0.00	$ 0.00	$ 33,654,095.00
9.				
10.				
11.				
12. TOTAL (sum of lines 8-11)	$ 33,654,095.00	$ 0.00	$ 0.00	$ 33,654,095.00

SECTION D - FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$ 12,596,000.00	$ 3,149,000.00	$ 3,149,000.00	$ 3,149,000.00	$ 3,149,000.00
14. Non-Federal	$ 12,596,000.00	3,149,000.00	3,149,000.00	3,149,000.00	3,149,000.00
15. TOTAL (sum of lines 13 and 14)	$ 25,192,000.00	$ 6,298,000.00	$ 6,298,000.00	$ 6,298,000.00	$ 6,298,000.00

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. DE-FOA-0002740	$ 19,786,600.00	$ 11,411,100.00	$ 7,526,490.00	$ 3,392,000.00
17.				
18.				
19.				
20. TOTAL (sum of lines 16 - 19)	$ 19,786,600.00	$ 11,411,100.00	$ 7,526,490.00	$ 3,392,000.00

SECTION F - OTHER BUDGET INFORMATION

21. Direct Charges:

22. Indirect Charges:

23. Remarks:

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:* Virginia Electric and Power Company

** Street 1:* 120 Tredegar Street *Street 2:*

** City:* Richmond *State:* VA: Virginia *Zip:* 23219

Congressional District, if known: VA-004

5. If Reporting Entity in No.4 is Subawardee, Enter Name and Address of Prime:

6. * Federal Department/Agency:

Department of Energy - GDO - OCED

7. * Federal Program Name/Description:

Grid Infrastructure Deployment and Resilience

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:* Funds will not be used for lobbying *Middle Name:*

** Last Name:* Funds will not be used for lobbying *Suffix:*

** Street 1:* Funds will not be used for lobbying *Street 2:*

** City:* Funds will not be used for lobbying *State:* *Zip:*

b. Individual Performing Services (including address if different from No. 10a)

Prefix: ** First Name:* Funds will not be used for lobbying *Middle Name:*

** Last Name:* Funds will not be used for lobbying *Suffix:*

** Street 1:* Funds will not be used for lobbying *Street 2:*

** City:* Funds will not be used for lobbying *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:** Amanda Prestage

***Name:** *Prefix:* ** First Name:* Amanda *Middle Name:*

** Last Name:* Prestage *Suffix:*

Title: General Manager - Corp Strategic Planning **Telephone No.:** 804.771.4416 **Date:** 03/16/2023

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Standard Form - LLL (Rev. 7-97)

Dominion Energy Virginia | Analytics and Control for Driving Capital Efficiency Project

FOA and Topic Area: Department of Energy (DOE) – Grid Resilience and Innovation Partnerships (GRIP) | Smart Grid Utility and Industry Competitive Grants

Concept Paper Identification Code: TA2-149-E

Business and Technical Point of Contacts

Business Contacts	Technical Contacts	Project Area
Dr. Matthew Gardner matthew.gardner@dominionenergy.com Heather Eades heather.eades@dominionenergy.com	Rick Siepka rick.siepka@dominionenergy.com	Grid Edge Visibility (GEV)
	Dr. Kevin Jones kevin.d.jones@dominionenergy.com	Dynamic Performance Monitoring (DPM)
	Marlu Deverick marlu.n.deverick@dominionenergy.com	Dynamic Line Ratings (DLR)
		Grid Forming Inverter (GFI)

Senior/Key Personnel

Name	Project Area	Organization
Robert Mason	Dynamic Line Ratings (DLR)	Dominion Energy Virginia
Mark McVey	Grid Forming Inverter (GFI)	
Dr. Micah Till	Dynamic Performance Monitoring (DPM)	
Aaron Tickle	Grid Edge Visibility (GEV)	

Name of all team member organizations

Virginia Electric and Power Company, d/b/a Dominion Energy Virginia (DEV or the Company), will be the primary organization executing the Analytics and Control for Driving Capital Efficiency (ACDC) project. Identified teaming partners include Mitsubishi Electric Power Products, Inc. (Mitsubishi), PingThings, LineVision, and GE Digital. Others may be added over time.

Project location(s)

VA-001; VA-002; VA-003; VA-004; VA-005; VA-006; VA-007; VA-008; VA-010; VA-011; NC-001

Statement of Confidentiality

DEV proposes in good faith that certain information designated herein be withheld from public disclosure on the grounds that it contains trade secrets, privileged, or confidential commercial or financial information and is disclosing the information only to the members of the DOE staff directly assigned to the matter as necessary in the discharge of their duties. DOE counsel and all members of the DOE staff, until otherwise ordered by a regulating body with the authority to do so, shall maintain the information in strict confidence and shall not disclose its contents to members of the public, or to other staff members not assigned to the matter.

Project Overview

Background

Increases in clean energy generation and electrification have accelerated the energy transition nationwide – and they are on pace for exponential growth with recently passed federal funding for renewables, electric vehicles, and storage. Dominion Energy, Inc. (DE) has and continues to embrace opportunities to enable a nimbler network to safely deliver reliable, affordable, and sustainable energy across a more distributed system, take advantage of generational federal partnership and collaboration, and ensure a smooth and just transition for our customers and businesses. Our vision is to become the most sustainable regulated energy company in the country, a leader in the clean energy transition[1] – and we have made material commitments to achieve that ambition. We have identified more than $73B in potential decarbonization investments by 2035 to help reach our Net Zero target by 2050, which we will pursue regardless of federal partnership – though our progress would be significantly scaled with the U.S. Department of Energy's (DOE) Grid Resilience and Innovation Partnerships (GRIP) support.[2]

The GRIP Smart Grid grant program offers DEV, a subsidiary of DE that operates in Virginia (VA) and northeast North Carolina (NC), an incredible opportunity to go further and move faster with our energy transition objectives. With the Analytics and Control for Driving Capital Efficiency (ACDC) project, we would boost our distributed energy resource (DER) management capabilities with more control and coordination than previously possible and support our customers' expectations through more coordinated interconnection, leading to more strategic asset planning and deployment. This is critical given the expected deployment of renewables, electric vehicles, storage, microgrids, and electrification of end uses, which will only be fully realized when connected to a system that can effectively integrate and manage these resources. Through ACDC, we propose to meet three critical needs to enable the energy transition:

1. **Boosting Capacity.** Increasing network capacity is necessary for the expected three to four times increase in electric loads, electric vehicle (EV) sales (50% by 2030)[3], data center growth, and two to three times renewables growth in the next decade[4]
2. **Controlling Loads**. Controlling voltage and frequency fluctuations caused by inverter-based resources (IBR) like solar, wind, and storage are essential to absorbing 40% renewable penetration in the generation mix
3. **Improving Forecasting**. With $73B of decarbonization investments anticipated for DE through 2035, fidelity in asset planning and resource management will be paramount, informed by better intelligence about where and how to prioritize grid upgrades to

[1] Dominion Energy. "Our Company." 2023. https://www.dominionenergy.com/our-company
[2] Dominion Energy. "ESG Update Materials | Fall 2022." 2022.https://s2.q4cdn.com/510812146/files/doc_presentations/2022/11/2022-11-21-Fall-ESG-Update-vTC.pdf.
[3] The White House. "FACT SHEET: President Biden Announces Steps to Drive American Leadership Forward on Clean Cars and Trucks." https://www.whitehouse.gov/briefing-room/statements-releases/2021/08/05/fact-sheet-president-biden-announces-steps-to-drive-american-leadership-forward-on-clean-cars-and-trucks/.
[4] Office of EERE. "NREL Study Identifies the Opportunities and Challenges of Achieving the U.S. Transformational Goal of 100% Clean Electricity by 2035." Department of Energy.2022. https://www.energy.gov/eere/articles/nrel-study-identifies-opportunities-and-challenges-achieving-us-transformational-goal

meet surging electrification and geographically diverse load growth

ACDC would achieve these through a pioneering set of transmission and distribution sensors, devices, and systems that would increase grid flexibility, unlock asset efficiencies, and mitigate localized or wide-spread outages that stem from surging and uncoordinated DER growth. We include four distinct, interrelated 'plays' within ACDC to achieve this objective. They are:

Scope of ACDC Investments

	Ambition	Project Scope
Transmission	**Boosting capacity**	• **Dynamic Line Rating (DLR)** system – Includes 1) deployment of sensors with spatial telemetry on key transmission lines across 35 square miles that service critical data center loads in Northern VA; and 2) deployment of scalable prediction engine/control modules to allow transmission operators to identify additional existing capacity, mitigate short-term congestion, and gain operational flexibility. This investment has the potential to deliver 10 to 30% additional capacity in the largest known deployment of its kind to date, globally
Transmission	**Controlling loads**	• **Grid Forming Inverter (GFI)** – A pilot of GFI technology to develop capabilities and protocols for widespread adoption by DEV. Pilot would deploy first-of-its-kind GFI on an active renewable interconnection for rural micro-grid enablement
Transmission	**Improved forecasting**	• **Dynamic Performance Monitoring (DPM)** – A cutting-edge effort to instrument DEV's transmission network with greater than 1kHz resolution and develop a predictive platform to understand the dynamic performance and stability of utility-scale renewables. Would optimize and inform future capital investment planning as renewable generation expands
Distribution	**Improved forecasting**	• **Grid Edge Visibility (GEV)** – Deploying devices and control capabilities to 100% of the remaining 3-phase 34.5 kV distribution network, enabling renewable integration at nearly 24,000 rural customer sites in VA and NC while equipping operators with intelligent grid devices

ACDC's proposed technologies and platforms span DEV's service territory, putting network-wide capabilities in the hands of system operators and planners. Our intelligent grid device deployments are targeted to strategic sites across the service territory for DPM and GEV. Our DLR investment is being made in Northern VA's Data Center Alley[5] where DEV's critical circuits support 70% of the world's internet traffic[6], as well as many U.S. intelligence and security agencies. Collectively, these investments in critical hardware and software will deploy ~$67M over a five-year period, materially advancing our larger smart grid capabilities and providing us fundamental competencies for managing 21st century power systems.

DEV leads the industry in the development of many of these capabilities given our urgent need to manage surging solar generation, load growth associated with data centers, EVs and non-EV electrification. Over the last ten years, we have piloted similar technologies to those in ACDC. With DOE partnership, we would create a clear and achievable pathway to standardizing and

[5] Economic Development. "Data Center Alley Overview." Loudon County. 2023. https://biz.loudoun.gov/datacenteralley/

[6] Virginia Electric and Power Company. "Petition of Virginia Electric and Power Company." SCC. 22 June 2021. www.scc.virginia.gov/docketsearch/DOCS/5tps01!.PDF

scaling these technologies – and we are committed to sharing our best practices, findings, and approaches with our peers to lower learning curves and help our industry adopt these and similar technologies.

Project Development Efforts to Date

A brief history of our experience with ACDC technologies and adjacent capabilities includes:

Play	**History to Today** (aka baseline infrastructure and investments leading to ACDC)
Dynamic Line Rating (DLR)	2000s – DEV fully instrumented transmission grid for operator control 2010s – DEV began DLR modelling and research efforts in 2017 with LineVision 2020s – DEV instrumented a single circuit pilot, achieving on-average 13% additional capacity
Grid Forming Inverter (GFI) Pilot	2000s – Concept introduced by the Institute of Electrical and Electronics Engineers (IEEE) with the advent of DERs and inverter-based microgrids 2010s – DEV first studies GFI potential; Academic and National Renewable Energy Laboratory (NREL) research underway 2020s – DEV founds DOE-sponsored working group with operators
Dynamic Performance Monitoring (DPM)	2000s – DEV first conceptualizes a fully-instrumented transmission grid 2010s – DEV deploys 100% Phasor Measurement Unit (PMU) coverage and commercializes linear state estimator 2020s – DEV begins experiencing weekly dynamic performance issues and partners with Berkeley and PingThings to address
Grid Edge Visibility (GEV)	2000s – Deployment of first-generation grid devices which had minimal programmability 2010s – Intelligent recloser technology and distribution automation piloted 2020s – Fault location, isolation, and service restoration (FLISR) and advanced distribution automation technologies under development

We are grateful to the DOE for the opportunity to co-invest in a greener, more cost effective and flexible network for the citizens of VA and NC – and look forward to detailing how our project advances the clean energy transition and our climate goal in the pages below.

Project Goal

The Commonwealth of VA, the State of NC, and DE have developed energy and climate goals – all with net zero targets, planned investments, and clear roadmaps for 2050. To meet these, we estimate DEV will need to produce and/or interconnect 85,000 GWh of new clean energy by 2050.[7] That enormous amount of renewable energy will require both capacity increases on the bulk power system as well as new tools to maintain grid stability and reliability.

Traditional capacity increases require upgrades to conductors or double circuits while solutions to inverter-based resource (IBR) variability have relied on flexible alternating current transmission system (FACTS) devices that allow operators to balance and synchronize waveforms, phases, and loads. Without action, overloading in circuits and the variability of IBRs would prematurely age grid assets and significantly decrease system stability margins.

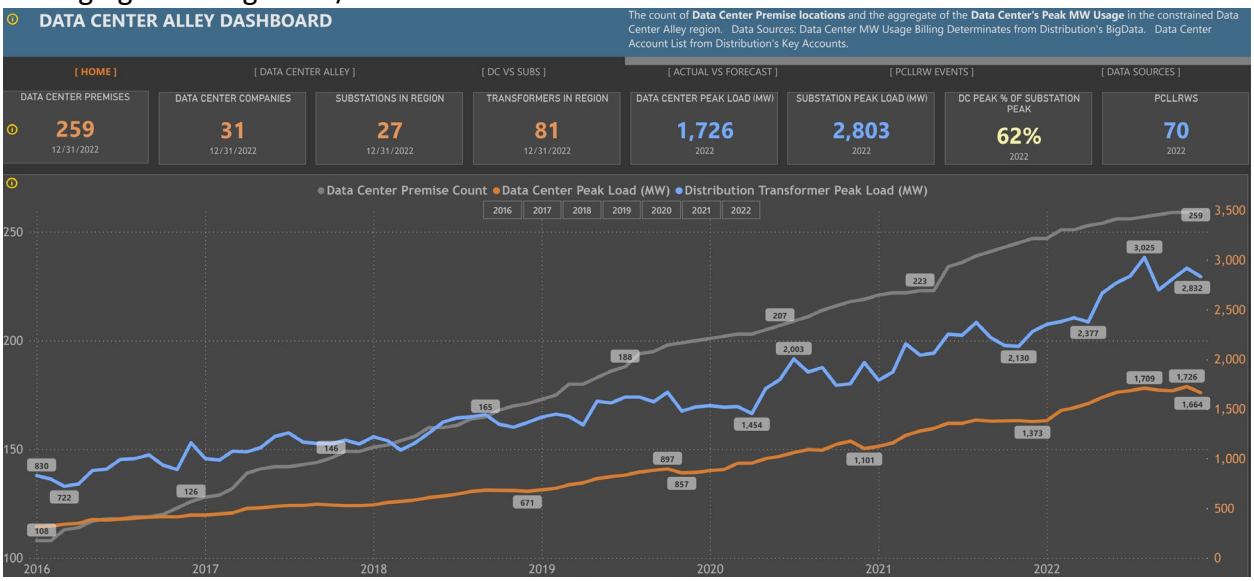
These are not theoretical risks. We have seen a **200 to 500% increase in load** over the past three years on some circuits serving the digital economy and national security apparatus. Our

[7] Virginia Electric and Power Company. "2022 Update to Integrated Resource Plan." September, 2022. Pg. 14 7nkm01!.PDF (virginia.gov)

goal with ACDC is to preempt those adverse impacts through superior forecasting, monitoring, and control capabilities that not only support stable and reliable electricity supply, but also accelerate essential renewable and DER integration needed to achieve our collective Net Zero targets.

Data Center and Load Growth on Northern VA Circuits

Averaging 40 MW growth/month between 2019-2022.



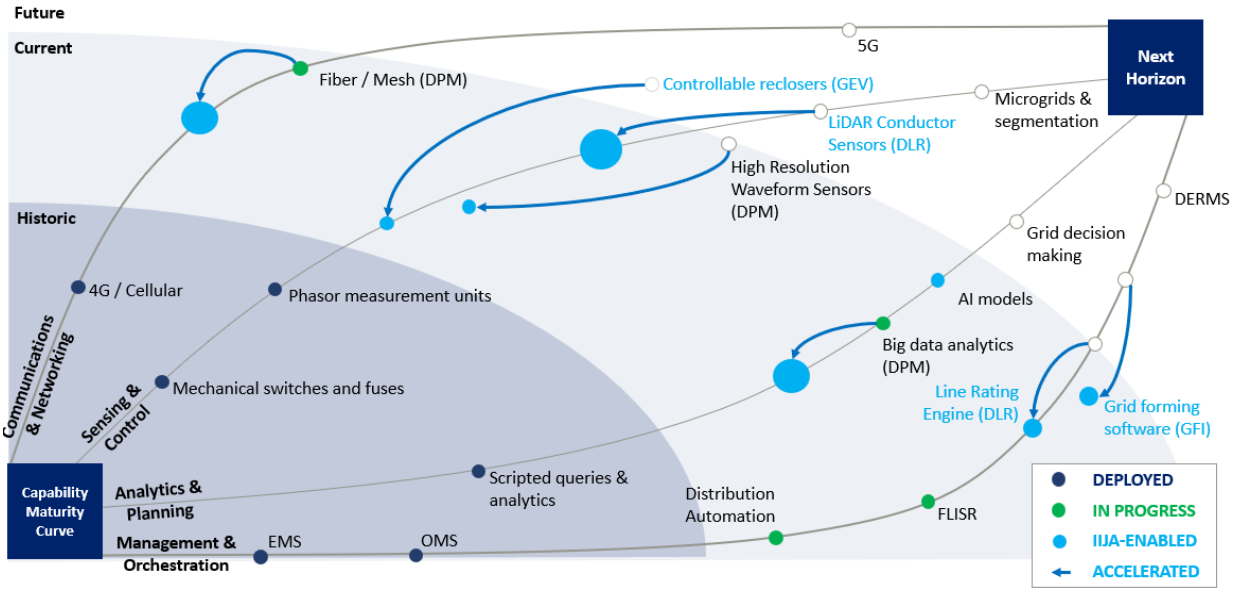
Targeted Improvements and Critical Success Factors

Grid management is a core capability of any network operator – and the fundamentals of that management have been radically redefined with DER. They will require new thinking, new controls, and new systems to maintain reliability. Over the past ten years, DEV has pioneered smart grid technologies with the DOE and the Federal Energy Regulatory Commission (FERC), and we are excited to build on that history with GRIP funding around key grid management capabilities like:

- Communication and Networking – the backbone that transfers data
- Sensing and Control – detecting DER and managing the flow of power
- Analytics and Planning – the tools that enable decision making
- Management and Orchestration – the systems that allow interactions

The chart below illustrates the broad history of smart grid technologies that DEV has historically used, currently operates, and has planned for future incorporation/adoption. The blue overlay indicates where GRIP funding would unlock and accelerate capabilities and benefits, with the size of the blue circle indicating the level of expansion. ACDC would impact all four of the above grid management capabilities, bringing greater competencies and controls to scale much faster than we have in our current capital plan for our DPM expansion. Moreover, it would directly instigate GEV sensor deployment, piloting the GFI program, and DLR sensors and software deployment.

Technology development curves and how GRIP would accelerate and scale them



The table below indicates what targeted improvements ACDC would make to our baseline grid management capabilities and infrastructure, along with critical success factors for achieving those.

ACDC targeted improvements and critical success factors

Play	Targeted Improvement	Critical Success Factors

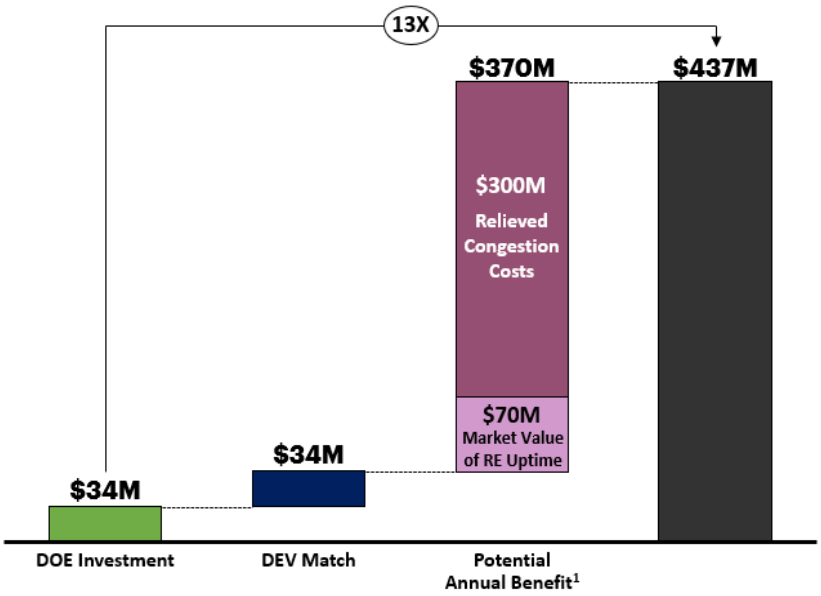
Dynamic Line Rating (DLR)	• Deploy DLR sensors on critically congested circuits in the largest at-scale DLR rollout, globally
	  ○ Minimize assumptions-based operational limits
	  ○ Potential to increase day-of capacity on severely congested lines by 10 to 30%, on average
	  ○ Avoid locational-market pricing that increases with higher loads
	• Develop playbook and standards to inform FERC rulemaking and PJM guidance
		• LineVision partnership strength
		• Key personnel who have engaged with DLR since 2012 at the Company
		• C-suite endorsement of investment

Grid Forming Inverter Pilot (GFI)	• Develop first-of-its-kind open-source control algorithm and software ○ Publish and share findings • Formalize internal DEV capabilities for device and software • Deploy a “healthy” microgrid for a rural community of 2 to 4MW	• Strong co-creating relationship with Mitsubishi • High voltage laboratory (under construction with globally renowned capabilities) • C-suite endorsement of investment
Dynamic Performance Monitoring (DPM)	• Avoid renewable curtailments due to IBR-induced instability • Expand to uniform grid coverage at key sites for waveform visibility • Commercialize predictive engine for oscillation detection	• North American SynchroPhasor Initiative (NASPI) relationship and industry leadership on technology • PingThings relationship and investment • C-suite endorsement of investment
Grid Edge Visibility (GEV)	• Deploy telemetry capabilities to 100% of 3-phase 34.5 kV distribution network	• Experienced field personnel and contractors • Strong project management team

Play	Targeted Improvement	Critical Success Factors
	○ Enable significant potential growth of DER on relevant circuits ○ Provide control capabilities to 24,000 customer sites • Remove antiquated, oil-filled devices • Enable intelligent distribution planning process to improve and target grid investments	• C-suite endorsement of investment

Maximizing Federal Investment Impact

DOE funding would significantly scale and accelerate DEV's ability to test and deploy innovative technologies across all proposed activities. While the activities of ACDC will benefit the grid immediately, their outlook for funding outside of DOE support is five to ten years away. With DOE's support, we would catalyze what our industry needs and wants – to manage congestion and stability. ACDC's benefits can be tangibly measured in dollars, carbon emissions reductions, and reliability from increased renewable uptime and avoided congestion costs, as highlighted in the above chart. We have identified two kinds of societal benefits to quantify – relieved congestion costs and increased renewable generation – totaling approximately $370 million on average in the years following the ACDC project completion in 2028.



[1]Potential Annual Benefit represents the average savings that DEV customers would experience **annually** as a result of increased visibility and remote monitoring of the electric grid. This is projected in 2029 based on 2022 data.

Transmission congestion costs are borne by all customers and result from economically inefficient movement of power throughout the PJM Interconnect. On a system-wide basis, congestion arises when transmission capacity limits prevent the lowest cost generation from serving the grid regardless of geographic location, resulting in higher cost from more localized generation. In 2022, customers in PJM's 13 states faced $2.2 billion in congestion costs due to these transmission constraints. The ACDC project targets the infrastructure responsible for 10 to 15% of total congestion in 2022, potentially worth up to $300 million in customer savings in 2022 depending on exogenous factors.[1] The value we are reflecting in the above chart

illustrates the potential level of congestion cost relief that could be achieved if ACDC were fully deployed today.

From a renewable energy perspective, we estimate ACDC could enable up to $70 million of clean generation to reach the grid that would otherwise be curtailed due to oscillations and replaced with more costly generation. We calculated this from anticipated solar growth needed to meet state legislative targets alongside the average cost of projected outages from 2029 to 2037. Altogether, we project ACDC would be able to avoid roughly 500 utility-scale renewable plant forced disconnects annually through superior monitoring, control, and DER management capabilities.[8]

Benefits measures by project activity

The following table summarizes key system benefits for each ACDC play.

Play	Benefits (Achieved by 2029)
Dynamic Line Rating (DLR)	• Mitigates potentially $300 million of congestion costs borne by Virginians[8] • Improves short-term system flexibility for switching for industrial customers • Achieves operational expertise needed for territory-wide expansion to enable more renewable energy interconnections
Grid Forming Inverter (GFI)	• First open-source grid forming software ever developed for utility-use • First installed 2 to 4MW renewable microgrid for islanded rural community • Insights for GFI DEV-wide rollout and PJM/FERC rulemaking process
Dynamic Performance Monitoring (DPM)	• Achieves coverage of key transmission and generation assets with 1 kHz telemetry • Avoids forgoing up to $70 million in value from clean energy due to curtailment[9]
Grid Edge Visibility (GEV)	• Improves grid planning with access to more DER data from GEV devices • Supports significant projected increase in DER penetration behind 88 devices • Provides 24k customers with direct visibility and restoration potential from investment

Community Benefits Plan: Delivering the Energy Transition Faster, Justly, and Equitably

Our ACDC project is focused on a smarter, more flexible grid, and facilitating acceleration of the energy transition, on a system-wide basis rather than in a particular jurisdiction. Even when projects are not geographically located within disadvantaged communities, DEV is committed to ensuring the work is performed equitably, with proper stakeholder involvement and with a focus on skilling and the creation of green, industry-related jobs. We detail ACDC-specific engagement plans in our Community Benefits Plan (CBP) portion of this application. It lays out actions to ensure we deliver benefits to all our communities across our territory, regardless of project location.

[8] Monitoring Analytics. "2022 State of the Market." 2022 State of the Market Report for PJM (monitoringanalytics.com)

[9] Presumes the average annual benefit following full deployment by 2029 through 2037 based on IRP solar load growth in conjunction with VCEA targets (Scenario B), as noted in Footnote 7.

About 40 individual Disadvantaged Communities (DACs) in DEV's service territory will have one or more of the ACDC activities located inside of it. We have already begun outreach to local community leaders to ensure communities, especially historically underserved populations, are meaningfully engaged throughout the project. From a workforce development (WFD) perspective, our CBP also lays out our plan for doubling our current formal roster of technical colleges and universities to help skill critical talent needed for managing and scaling a distributed, decentralized, and digitized grid. While we expect to create 10 to 20 new jobs over the next five years through ACDC, we anticipate many more being catalyzed by the energy transition, and we plan on preparing pathways and onramps to those opportunities with our partners. These plans and our priorities for recruiting a sustained and diverse roster of talent are detailed in our CBP.

Long-term Constraints, Risk Mitigation, and Climate Resilience Strategy

DEV does not anticipate any long-term constraints on the community's access to natural resources because of the nature of the ACDC project. In fact, due to ACDC's potential to more intelligently inform long-term capital investments like transmission tower and conductor upgrades, the ACDC sensors and platforms may reduce future burdens to natural, community, tribal, and cultural resources. For DEV, this is critically important as our transmission network crosses sensitive lands. By using technology, we hope to improve our ability to be a good neighbor while enabling a cleaner energy future for us all.

Furthermore, the digital activities within ACDC support climate resiliency efforts by DEV and from our state, regional, local, and tribal partners. For example, in the coastal regions of VA and NC, counties and towns have increasingly emphasized the need for infrastructure which is resilient to severe weather – from hurricanes to ice storms – in their local planning efforts. Capabilities, like the GFI, equip DEV to support those efforts through localized microgrids that can be powered by renewable resources.

Technical Description, Innovation, and Impact

Relevance and Outcomes

Renewable energy and electrification play a vital role in achieving our net zero goals, reducing pollution, and enabling a distributed energy economy for our communities. Uncoordinated, however, they also create challenges for DEV and other grid operators because they introduce uncertainties such as instability, variability, and congestion into a system that is required to deliver reliability.

ACDC addresses these through smart grid technologies that mitigate instability risks, while providing greater coordination of DER by:

- deploying DLRs to allow DEV's operators to help manage capacity constraints
- addressing renewable and distributed energy issues through advanced big-data performance monitoring
- distributing smart reclosers on the grid edge to improve operator control and understand distributed energy resources

- developing the next generation of capabilities and designs for GFIs to manage renewable penetration and improve control and resilience

Summary of ACDC Investments and Locations

Play	Project Locations					Cost ($M)		
	T/D	NC	VA	Total	Unit	NC	VA	Total
Dynamic Line Rating (DLR)	T	0	60	60	Devices Deployed	$0	$29	$29
Grid Forming Inverter (GFI) Pilot	T	0	1	1	Device Deployed	$0	$5	$5
Dynamic Performance Monitoring (DPM)	T	0	50	50	Devices Deployed	$0	$22	$22
Grid Edge Visibility (GEV)	D	14	74	88	Devices Deployed	$2	$8	$10

Each of these ACDC plays fit closely with the DOE's areas of emphasis[10] for delivering smart grid investments that future proof the grid for renewables and electrification:

ACDC project eligible uses

40107 Areas of Focus	Corresponding Activity
Increasing transmission capacity and operational transfer capacity	• DLR improves the accuracy and transparency of line ratings, potentially reducing wholesale prices and saving customers money • GFI equips DEV to handle the high penetration of renewables and provides ancillary services
Improving the visibility of the electrical system to grid operators	• DLR sensors provide near-real-time visibility into the physical characteristics of bulk transmission infrastructure • GEV devices provide grid edge visibility supporting real time operations, granular forecasting and engineering analysis • DPM provides empirical and analytical business intelligence to drive management of dynamic performance and stability
Enhance secure communication and data flows	• DPM requires high-resolution telemetry and therefore requires upgrades in network capacity. This increase in network capacity will have many downstream performance benefits
Aggregation and integration of distributed energy resources and other 'grid-edge' devices	• DPM allows DEV to manage the dynamic performance of inverter-based resources, thereby maximizing their contribution to energy delivery, reliability, and resiliency and removing a reliability/cost-driven "glass ceiling" of renewable integration • GEV increases real-time grid visibility that establishes baseline data for examining grid impacts of DER growth and aggregation • GFI allows DERs to increase the reliability and sustainability that DEV provides to customers by reducing restoration times and/or allowing healthy microgrids to form
Enhancing interoperability and data architecture of systems	• DLR can provide operators, when integrated to the Energy Management System, better visibility into the true physical and electrical state of the grid • GEV capability better informs integrated resource planning by increasing visibility of DER impacts on overall resource plans

[10] Grid Deployment Office. "Smart Grid Grants." *United States Department of Energy*. 18 Nov. 2022, https://www.energy.gov/sites/default/files/2022-11/Smart%20Grid%20Grant%20fact%20sheet.pdf.

40107 Areas of Focus	Corresponding Activity
that support two-way flow of power	• DPM is a data-driven approach to the performance management of IBRs. This competency is one which all utilities must ultimately adopt. DEV will pave the way forward
Anticipate and mitigate the impacts of extreme weather or natural disaster on grid resiliency	• GFI can mitigate these events by allowing IBRs to re-incorporate faster into the grid and provide black-start capabilities • DLR sensors provide analytics to understand the behavior of lines during weather events and provides alerts on weather conditions such as icing or extreme winds

Boosting Capacity

We have a critical need to address congestion caused by load growth, specifically as our service territory is handling exponential data center expansion. The ACDC project proposes addressing near- and long-term capacity issues by installing, calibrating, and operationalizing 60 sensors for a DLR systems within the Northern VA region to expand on DEV's pilot established in 2017. Through ACDC, we would achieve the largest deployment of DLR in the world.

Currently, DEV's network capacity is set through a combination of transformer and conductor 'ratings' that specify how much electricity can flow through them at any given time. These are either 'static ratings' or 'Ambient-Adjusted Ratings' (AAR), which means they are fixed from one hour and day to the next – i.e., they do not account for the variability of weather conditions.

AAR often underperform a circuit's true capacity potential – often by 10 to 30%.[11] Using a 'dynamic line rating' calculated from sensor data and advanced analytics allows us to immediately monitor the actual capacity on targeted lines – and, when feasible, alter operations to avoid unnecessary re-dispatch of generation. When possible, this has the potential to eliminate congestion costs for customers and ensures that the cheapest and greenest energy is dispatched. PJM's estimation shows an **8.4 times return on the deployment cost in just congestion savings** stemming from DLR use.[12]

DEV has worked with the leading DLR vendor, LineVision, since 2017 to gain critical experience deploying and proving the benefits of DLR. Through this partnership, we achieved an average of 13% capacity gain on a recent year-long pilot on a 230kV circuit. For context, the DOE's Dynamic Line Rating Systems for Transmission Lines Topical Report from 2014 indicated that "10% additional capacity would practically eliminate all congestion on the target lines."[13]

[11] Murphy, S. "Dynamic Line Ratings Overview." PJM, 2021. https://www.pjm.com/-/media/committees-groups/committees/oc/2021/20210330-special/20210330-item-01-dynamic-line-ratings-overview.ashx

[12] Murphy, S. "Dynamic Line Ratings Overview." PJM Interconnect. Pg. 11. https://www.pjm.com/-/media/committees-groups/committees/oc/2021/20210330-special/20210330-item-01-dynamic-line-ratings-overview.ashx

[13] U.S. Department of Energy, Electricity Delivery & Energy Reliability, et al. *Dynamic Line Rating Systems for Transmission Lines*, p. 59. https://www.smartgrid.gov/document/dynamic_line_rating_systems_transmission_lines

We expect to replicate this performance in ACDC's deployment of DLR and achieve two primary benefits. First, by operating at higher capacities, DLR-equipped circuits can provide additional operational flexibility, supporting short-term additional load and generation growth that would otherwise be handicapped. This means more zero-carbon generation, and more high-tech economic development for Virginians.

Second, in the long term and beyond the scope of ACDC, DLR can help reduce the need for additional grid infrastructure. A typical transmission upgrade project takes five to ten years[14] to complete at a cost of $2 to 3 million per mile.[15] By increasing the throughput of existing lines, capital could be prioritized and deployed elsewhere by DEV (e.g., to lines that do need reconductoring) – helping target where and how capital is thoughtfully and meaningfully leveraged to accelerate net zero outcomes.

DEV's DLR activity proposed in ACDC will involve deploying structure-mounted sensors that are safer, faster, and cheaper to install and maintain than line mounted sensors. These sensors would be placed on existing DEV structures. We are also preparing for the necessary energy management systems (EMS) upgrades that will allow the control center and regional operator to leverage DLR for grid performance. By investing in the control center capabilities early, DEV will be positioned to expand DLR rapidly and affordably to other circuits and lines in months, not years, giving us a powerful tool to mitigate congestion.

Informed decision making

Grid-wide, FACTS devices have been broadly used to manage IBR oscillations and avoid curtailment and disconnect – but at significant cost and lead time. A standard FACTS device costs $20 million and has a 2-year minimum construction timeline. Once built, a single device can only rectify voltage nearby.

The ACDC project proposes deploying a canvas of high-resolution sensors, enabled by an analytics platform and data lake to identify and predict these issues weeks and months prior to any disruption. The signatures of each of these devices can be detected, but only with high frequency data collection. To achieve that fidelity, DEV will place 50 to 100 sensors at substations near "dynamic" elements such as renewable generators (e.g., solar, wind), utility-scale storage, and electrified/industrial loads. PingThings, our partner, will augment these with dispersed data acquisition from more than 3,000 telecom partner sensors to provide DEV with detailed and real-time information about the parameter of power flow across the grid.

[14] U.S. Department of Energy, *Grid-Enhancing Technologies: A Case Study on Ratepayer Impact*, p. 62. https://www.energy.gov/sites/default/files/2022-04/Grid%20Enhancing%20Technologies%20-%20A%20Case%20Study%20on%20Ratepayer%20Impact%20-%20February%202022%20CLEAN%20as%20of%20032322.pdf.

[15] Historical costs from 2005-2019 "2019 Project Statistics - PJM." *PJM*, Transmission Expansion Advisory Committee, 12 May 2019, https://pjm.com/-/media/committees-groups/committees/teac/2020/20200512/20200512-item-10-2019-project-statistics.ashx.

This will enable our grid operators to pivot from a reactive stance – shutting off when IBR issues arise and conducting root cause analyses – to a proactive one that allows prediction and mitigation of the problem. DPM would also provide us critical insights needed to tailor and target operations and investments to ensure the grid is able to absorb renewables as they ramp.

DEV will also seek to replace existing analog assets and install additional intelligent grid devices to provide nearly 100 new points of visibility for data acquisition and control at the grid edge through our GEV activity. This expansion delivers 100% of our remaining 34.5 kV 3-phase legacy recloser retrofits and substantially supports grid visibility in rural communities that have great potential for renewable generation. These distribution feeders support more than 24,000 customers and are forecasted to see significant growth in behind-the-meter DER through 2030, presenting a risk for voltage stability due to the lack of grid visibility from legacy hydraulic oil-filled reclosers. GEV will increase control capabilities for system operators to respond to unexpected scenarios. Most importantly, these devices will provide telemetry that bolsters predictive modeling efforts to develop increasingly granular planning insights for the distribution grid edge. The high-density time-series data from these efforts could allow predictive support of interconnection study requests, shortening PJM Interconnection's queue for clean energy to come online faster while reducing outages and costs for network upgrades.

Increasing Control

While DLR, DPM, and GEV support the rise of renewables and electrified loads, DEV currently maintains a toolkit of only small-scale solutions to mitigate issues IBRs introduce into the grid at their point location. As renewables become an increasingly prominent part of DEV's generation mix, more comprehensive controls will be required to allow for observability and synchronous control of inverter-based devices to withstand surges, faults, black restart, and interaction with other power inverter devices. To do this requires advanced, open-source control algorithms, allowing all manufacturers and operators to work consistently throughout the grid. Through a partnership with Mitsubishi, we will bring life to the GFI concept that has mostly existed in theoretical or research applications with NREL and others.

We will procure a programable inverter and test disparate algorithms and control functionalities for battery energy storage systems (BESS) already on the grid at our test facility in Petersburg, VA, including a high-voltage laboratory that will come online during the ACDC project. In conjunction with Mitsubishi, this real-world pilot will expand our capabilities and produce both a roadmap and open-source code for use by others. Key objectives include developing operational capabilities for usage on the grid as well as gaining valuable insights that would allow us to inform FERC and PJM rulemaking around the benefits and use of GFIs.

The success of GFIs depends on their ability to enable microgrids and islanding powered by DERs with generation and blackstart capabilities. That hurdle has never been surmounted in a public, operational deployment. Through ACDC, DEV will site and install the GFI at a DER solar site of between 2 to 4MW with microgrid potential in a rural community. We will then work to integrate this capability into our business processes and operational technology. We anticipate

that this first-of-its-kind use will pave the way for significant increases in flexibility and resiliency for grid operators and provide tangible benefits for the community that works with us on this effort.

Feasibility

From a feasibility perspective, we have high confidence in these investments and have conducted detailed readiness assessments for each, evaluating them for feasibility and impact across a variety of aspects. These include, but were not limited to, the strength of our business case to materially benefit our grid monitoring and control capabilities (as weighed individually and against other alternatives); the depth and reliability of our delivery partnerships, the capacity of our internal teams; the impact on our broader grid to help drive resiliency and/or reliability; the level of capital required to match federal funding and then sustain projects beyond GRIP partnership; the alignment with our environmental, social, and governance (ESG) commitments and those of our state and regional partners; the level of innovation each play would deliver and whether that impact would contribute to sustained capabilities; and, overall community impacts with respect to the creation of jobs, provision of workforce development opportunities, or delivery of economic benefits. ACDC reflects the highest combinations of both feasibility and impact across the candidate 'plays' considered – and we have no doubt about its overall readiness from a capital, community, environmental, capability, or capacity perspective.

As detailed in the "Project Development Efforts to Date" and "Technology development curves" sections above, we have already invested in moving each of the proposed ACDC activities up the innovation curve, sometimes by a decade. From a location standpoint, we have conducted detailed analysis on where this infrastructure would best benefit the grid and our communities – and achieve our desired pilot outcomes, where applicable (e.g., concentrating in DACs, where possible, to complete outstanding device deployment (i.e., GEV); expanding our existing DLR pilot across Data Center Alley; locating our GFI in a rural community that would best benefit from a microgrid deployment; focusing DPM data pulls in densely concentrated IBR areas for maximum behavioral insights).

From a risk management perspective, our teams have conducted and passed through an executive-level detailed risk review to ensure we have the right combination of feasibility, desirability, and viability for DEV to make such a material commitment as ACDC – especially one that is incremental to our capital plans. The below table reflects a short summary of identified risks and mitigation steps.

Risks and mitigants

Activity	Risk	Mitigation
Dynamic Line Rating (DLR)	• Weather or other exogenous factors decrease anticipated ratings	• Extended coverage will enable DEV to demonstrate DLR potential in operational activity
	• New software control technology. Minimal proof points	• Perform extensive testing before pilot deployment. Continuous collaboration with supplier

Activity	Risk	Mitigation
Grid Forming Inverter (GFI) Pilot	• Equipment supply chain constraints	• Work with BESS developer to scope unit size and location to meet desired deployment dates
Dynamic Performance Monitoring (DPM)	• Insufficient bandwidth for DPM sensors to transport 1kHz data from substation to PredictiveGrid platform	• Scoped desired data throughput with IT group. Data architecture identified to reduce bandwidth while keeping data integrity. Performed preliminary lab tests to validate estimated file sizes
	• Organizational staffing cannot support installation of additional DPM sensors	• Evaluated previously installed sensors per year with project management to determine a reasonable additional amount to install over the five-year period
	• Supply chain impacts lead to a decrease in sensor availability or discontinued product line	• Continuous collaboration with DPM sensor vendor throughout project lifecycle to ensure sensor availability
Grid Edge Visibility (GEV)	• Labor shortages hinder device installation timeline	• DEV maintains a variety of relationships with contractors to support work volumes
All	• Inflation exceeds estimates over the performance period	• DEV maintains long-term contracts and strong vendor relationships
	• Small technology partners have poor credit or cease operations during projects	• DEV has made strategic investments in partners and conducts rigorous credit checks
	• Key personnel depart DEV prior to project completion	• While named individuals are important for these projects, each oversees a talented team

Innovation and Impacts

As with any smart grid effort – digitization is not enough to tackle congestion and unpredictability – data collection and analysis must be paired with communications, control, and device management to provide additional capability today, tailor investments for tomorrow, and understand and manage the grid of the future. ACDC will require a tuning of our systems and business processes and because these investments are not part of our current capital plan, ACDC would give us a significant 'head start' on vital software upgrades, process synchronization, and standards development needed to fully scale DPM, DLR, and GFI across our service territory. Collectively, they would accelerate our grid control and management capabilities by a minimum of five years; meaning we would have insights and empirical experience to share with our industry peers much sooner than through the course of our current grid modernization roadmap.

A summary of how ACDC advances the management of a distributed, clean, and increasingly autonomous grid includes:

- Enabling the largest deployment of DLRs at scale in the world
- Developing the first set of open-source software for a GFI
- Deploying the first GFI for microgrid capabilities
- Enabling an increase in rural solar potential and reliability for 24,000 customers
- Enabling the monitoring of dozens of nodes on the transmission network at 1 kHz

How the project supports State, local, Tribal, regional and other plans

ACDC's proposed innovations advance a cleaner, faster, digital energy transition in VA and NC with solutions centered on planning for and stabilizing the grid to increase clean renewable generation hosting capacity. Our state partners have decarbonization goals enshrined in statute such as the VA Clean Economy Act (VCEA) and the NC Clean Energy Plan (NCCEP). While nuanced in their interpretations and objectives, both states, as well as many of their cities, are charting courses for 100% clean grids and net zero emissions – for which ACDC will provide fundamental and necessary competencies. A cross walk of state and regional priorities and how ACDC helps advance these is reflected in the below table:

Category	VA Targets/ Goals	NC Targets/ Goals	ACDC Alignment to Goals
Emissions	Carbon pollution free by 2050[16]	Reduce electric power GHGe by 70% below 2005 levels by 2030 and attain carbon neutrality by 2050[17]	Through DPM, we anticipate curbing clean-energy generation curtailment (largely solar). The annual average benefit is estimated to be approximately $70 million
Renewable Mix	30% of VA's electricity from renewable energy sources by 2030[18]	Modernize regulatory and planning processes to foster energy affordability and price stability[17]	ACDC will allow for stable integration of renewable energy by controlling voltage and frequency
Clean Energy Innovation	VA shall produce 100% of its electricity from carbon-free sources by 2040[18]18 above	Executive Order 246 - Deep Decarbonization Pathways Analysis to help better understand viable pathways to achieve net-zero 50% new vehicle sales zero emissions by 2050[19]	DLR will help accelerate grid upgrades, by both providing capacity boost in targeted locations and helping triage and plan critical asset deployment needed to support renewable energy growth and electric vehicle adoption
Job Creation and Retention	Create up to 13,000 jobs per year in VA's advanced energy industry[16]	Accelerate clean energy innovation, development, and deployment to create economic opportunities[17]	DEV has expanded its efforts to create WFD pipelines focused on grid modernization and energy transition skill sets; and will be doubling the number of formal academic institutions with whom it partners to train and recruit

Impact of the project on technology risk; deployment at-scale; and private sector investments

[16] Division of Legislative Automated Systems. "Virginia Clean Economy Act." 2020. law.lis.virginia.gov/uncodifiedacts/2020/session1/chapter1193/

[17] State Energy Office. "North Carolina Clean Energy Plan." State of North Carolina. 2019. https://files.nc.gov/ncdeq/climate-change/clean-energy-plan/NC_Clean_Energy_Plan_OCT_2019_.pdf

[18] Division of Legislative Automated Systems. "Code of Virginia." 2023. https://law.lis.virginia.gov/vacode/title45.2/chapter17/section45.2-1706.1/

[19] Cooper, R. "Executive Order No. 246: NC Transformation to a Clean, Equitable Economy." January 7, 2022. https://governor.nc.gov/media/2907/open

Partnership with DOE on ACDC, paired with DEV's renowned engineering team and partners, will allow us to build the necessary tools for successful energy transition, deploy these tools at scale, and help lead the industry in standardizing the tools and solutions just as we have in the past. DEV's historic commitment to innovative technology has paved the way for decades of improvement in the energy industry. We were one of the first to deploy 500kV conductors, mobile transmission substations, and static synchronous compensators (STATCOMs) in North America. We also developed the first three-phase linear state estimator to be commercialized. We understand how to advance technologies from pilot to wide-spread commercialization – and our intent is to do so with ACDC: our DPM, DLR, and GFI pilot plays.

With ACDC, we will be tapping a rich history and commitment to public-private innovation collaboration. For example, between 2009 to 2013 DEV, in partnership with VA Tech and Quanta Technology, used American Recovery and Reinvestment Act grant funding to install and integrate an initial deployment of PMUs on the DEV 500kV network and to develop a suite of network applications and visualization tools for real-time operations.[20] DEV used this project as the basis for establishing standardized PMU deployment as part of normal capital project execution – and has since open-sourced this technology to accelerate commercialization.

As grid edge thought leaders, we have a commitment to and history of sharing our lessons learned (including challenges) with our peers through working groups and forums, by publishing research papers, and by commercializing our technology with other partners. For each activity within ACDC, DEV is committed to delivering either an open source/commercial outcome or sharing results and practices with the industry at large:

Maximizing investments for industry-wide gain

Play	Effort
Dynamic Line Ratings (DLR)	• Inform FERC 881 rulemaking on DLR value-based on deployment • Publish wide-scale learnings from largest deployment globally
Grid Forming Inverter (GFI)	• Publish open-source software for GFI in conjunction with Mitsubishi • Publish papers on best practices for implementation with DOE working group
Dynamic Performance Monitoring (DPM)	• Commercialize 1 kHz data lake solution with PingThings • Publish papers on the benefit of DPM at the NASPI conference
Grid Edge Visibility (GEV)	• Continued involvement in advancing Integrated Distribution Planning capabilities with Electric Power Research Institute (EPRI) and peer utilities

How the project will have a significant effect on smart grid functions

To DEV, a smart grid is defined by the ability to maintain operational visibility and control at point locations on the grid while planning for future investments using data-driven insights. The ACDC project is centrally focused on both rounding out existing capabilities – such as instrumenting and controlling the entire 3-phase distribution network with reclosers to enable the energy transition (i.e., GEV) – as well as advancing the next horizon of smart grid

[20]Jones, Kevin D. "Three-Phase Linear State Estimation with Phasor Measurements." *Virginia Polytechnic Institute & State University*, 2011. https://vtechworks.lib.vt.edu/bitstream/handle/10919/32119/Jones_KD_T_2011.pdf?sequence=1&isAllowed=y

technologies. By deploying the world's largest DLR project, deploying the first-of-its-kind GFI for rural microgrid enablement, and developing an insights platform for how best to manage and control renewable loads – we will materially expand our capabilities for managing surging load challenges of today, while achieving exceptionally greater coordination and control for doing so – at even greater scale – tomorrow.

ACDC would accelerate our smart grid ambitions by at least five years. It also would enable others to realize the benefits of a democratic smart grid – enabling independent power producers to connect their installations without data upgrade barriers and allowing DEV operators to interface with these devices to ensure reliability and stability through control and prediction capabilities.

How the project would enhance the system flexibility to meet program objectives

The ability to monitor, manage, and control DER is paramount for our increasingly distributed, decentralized, and digitized grid – and ACDC is designed to improve our capabilities to do so. We have immediate and pressing needs to maintain balance between generation and load uncertainty – especially in Northern VA, where we have seen a 200 to 500% increase in load over the past three years on some circuits, with a staggeringly high average of 40MW of new growth per month, since 2019. ACDC allows us to both manage this demand with a much greater set of tools, while also empowering us with deeper asset planning insights, so we can strategically deploy capital where its most critical to growth.

ACDC's major system flexibility enhancements have been detailed in the "ACDC targeted improvements and critical success factors" table above.

Workplan

Buy America Compliance

Buy America compliance does not apply to ACDC, since as stated in the Funding Opportunity Announcement, "based on 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." DEV is a for-profit entity and would be the prime recipient for ACDC; therefore, it is exempt from complying with Buy America requirements.

Project Objectives

DEV's project objectives are focused on delivering the benefits of a clean energy transition to our communities in VA and NC reliably, faster, and more widely than would otherwise be possible, without GRIP partnership. For a list of ACDC objectives, see the above "ACDC targeted improvements and critical success factors" table.

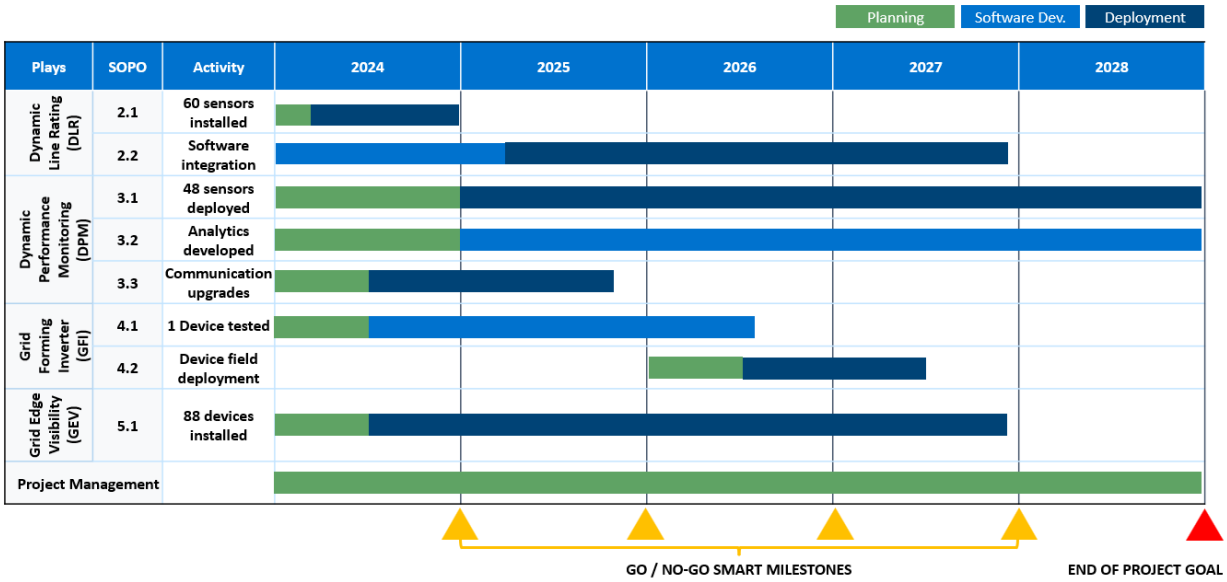
Technical scope summary

DEV has a rigorous technical program under consideration for the ACDC proposal. This includes the installation and configuration of a variety of sensors with observation and control capabilities: data fault recorders to gather point-on-wave data in 1 kHz, full instrumentation of

the 34.5kV network with recloser capabilities, and LiDAR sensors for the transmission network that not only inform throughput but also physical parameters like sag and icing. To complement these, DEV will deploy an EMS module to ingest line ratings and several analytics platforms that use sensor-based power and physical parameters to calculate and predict operational improvements that deliver reliability and sustainability benefits.

WBS, task description summary & project schedule

To address the challenges of the clean energy transition, DEV is planning systematic investments to enable a digital grid. We will deploy advanced technologies, such as sensors, control systems, and automation, to monitor and control power flows on the grid.



The following section details our workplan, major milestones, and proposed go/no-go decision points. This will be a 60-month project, launching after an anticipated Fall 2023 award through the winter of 2028. Our annual (12-month) Go/No-Go decision points would align to the calendar year.

Task 1.0: Project Management and Planning

Subtask 1.1 – Project Management Plan (PMP)

Within 30 days of award, DEV shall submit a Project Management Plan (PMP) to the designated Federal Project Officer (FPO). DEV 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 project, to capture any major/significant changes to the planned approach, budget, key personnel, major resources, etc.

DEV manages and directs the project in accordance with the accepted PMP to meet all technical, schedule and budget objectives and requirements. We will coordinate activities to effectively accomplish the work. We 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, DEV 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 project, to capture any major/significant changes.

Subtask 1.4: Continuation Briefing(s)

DEV 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 – Dynamic Line Ratings (DLR)

Subtask 2.1 – Sensor Deployment

DEV will deploy 60 sensors across our transmission network in Northern VA's Data Center Alley to measure physical parameters and behavior of conductors. We will work with vendors and engineering, procurement, and construction firms (EPCs) to deploy sensors on key transmission towers. This will include relevant communications technologies and the testing of sensors by vendors and DEV personnel.

Subtask 2.2 – Software Deployment

DEV will develop and implement a control and decision-making module in our EMS to allow for real-time and future-casted decisions about conductor capacity. We will purchase and integrate relevant software modules to allow our system operators to interface with line rating data and manage the transmission network with higher capacity. This also includes the deployment of a predictive future-casting line rating engine.

Task 3.0 – Dynamic Performance Monitoring (DPM)

Subtask 3.1 – Sensor deployment

DEV will deploy 48 new and upgraded sensors at critical substations across our transmission network to measure variation and instability. Our engineers will install firmware that enables additional measurements. We will contract with a vendor to measure an additional 3,000 sites to understand systemic variability and instability. These data will be consolidated in an expanded data lake.

Subtask 3.2 – Software development

To support decision making, DEV will refine research-grade software to fully enable predictive grid opportunities to deliver on the anticipated benefits. We will dedicate in-house resources as well as use contracted services to successfully complete this development activity.

Subtask 3.3 – Communications upgrades

With rapidly increasing data production, DEV will invest in upgraded substation and head end communications equipment to enable the DPM project. Our information technology group

will make critical network upgrades at each site and invest in an expanded digital backbone that is necessary for this frequency of data as well as future-proof for additional investments.

Task 4.0 – Grid Forming Inverter (GFI)

Subtask 4.1 – Test GFI in controlled environment

DEV will procure, install, and test parameters for a GFI to support the rise of IBR on the network, developing internal capabilities and protocols to accelerate clean generation adoption.

Subtask 4.2 Deploy GFI

The GFI will then be deployed to the field on a utility-scale solar site that can provide island/microgrid capabilities to a rural community.

Task 5.0 – Grid Edge Visibility (GEV)

Subtask 5.1 – Device Deployment

DEV will install 88 intelligent reclosers onto key 34.5kV distribution circuits that lack visibility and control capabilities. DEV engineering will identify and design sites. Field crews will be responsible for the installation, communication, and testing and commissioning of the devices.

Milestone summary & Go/No-Go Decision Points

The tables below indicate ACDC's quarterly and annual milestones. The milestones in the first, second, and third quarters of every year are progress checks to ensure ACDC is on track. Meanwhile, the milestones in the fourth quarter of every year are SMART technical milestones and will also serve as ACDC's Go/No-Go decision points. ACDC's overall progress will be compared against the SMART technical milestones every year. Progress measures in the first, second, and third quarters of every year will be verified by determining whether the activities in the milestones have been completed, including relevant project documentation (e.g., technical design documents, permit requisition requests). The SMART technical milestones in the fourth quarter of every year will be verified by determining whether the specified work in the milestones is ready to be or has been financially closed.

ACDC Milestones and Go/No-Go Decision Points

Milestones (Calendar Year)			
Q1 2024 – Progress Measures	**Q2 2024 – Progress Measures**	**Q3 2024 – Progress Measures**	**Q4 2024 – SMART Milestone and Go/No-Go Decision Point**
• 2.1 – DLR sensor locations selected and design complete	• 3.1 – Siting and work complete for DPM sensor locations • 3.3 – Communication backbone upgrade identified and scaled	• 2.2 – EMS module testing underway • 5.1 – Planning complete for GEV devices	• 2.1 – DLR sensor deployment complete on critically congested lines • 3.2 DPM data acquisition successful from 3,000 distributed sensors
Q1 2025 – Progress Measures	**Q2 2025 – Progress Measures**	**Q3 2025 – Progress Measures**	**Q4 2025 – SMART Milestone and Go/No-Go Decision Point**

Milestones (Calendar Year)			
• 2.2 – DLR control module functional in Energy Management System	• 3.3 – Substation MPLS upgrades completed • 4.1 – GFI attached to test bed	• 5.1 – GEV device deployment calendar set and first five devices active in field	• 2.3 - All System Operation Center personnel trained on new EMS module • 3.3 – All communication efforts completed
Q1 2026 – Progress Measure	**Q2 2026 – Progress Measure**	**Q3 2026 – Progress Measure**	**Q4 2026 – SMART Milestone and Go/No-Go Decision Point**
• 3.2 – Proof of concept for analytics platform developed	• 4.1 – Finish testing of GFI in controlled environment	• 5.1 – 30 GEV devices deployed	• 2.2 – Ten additional lines of DLR enabled
Q1 2027 – Progress Measure	**Q2 2027 – Progress Measure**	**Q3 2027 – Progress Measure**	**Q4 2027 – SMART Milestone and Go/No-Go Decision Point**
• 4.2 – Design GFI installation at field site	• 3.2 - Analytics platform in use by planning & protection teams	• 2.2 – All remaining DLR lines operational in EMS module	• 4.2 – Install GFI at utility-scale renewable site in DEV territory
Q1 2028– Progress Measure	**Q2 2028 – Progress Measure**	**Q3 2028 – Progress Measure**	**Q4 2028 – SMART Milestone and Go/No-Go Decision Point**
• Project retrospectives completed for GFI, DLR, and GEV efforts	• Benefits measurement and research underway for scope	• 3.2 - Analytics platform development complete	• 3.1 - 48 DPM sensors installed and upgrades at substations in DEV

End-of-Project Goal

ACDC's SMART end-of-project goals are summarized below for each of the identified tasks.

SMART End-of-Project Goals			
Dynamic Line Ratings (DLR)	**Dynamic Performance Monitoring (DPM)**	**Grid Forming Inverter (GFI)**	**Grid Edge Visibility (GEV)**
Deploy system-wide EMS control module and sensors on most critically congested network to provide 10 to 30% increased capacity on average	Distribute 48 sensors and ingest data from 3,000 additional sites into data lake for real-time visibility and reduced IBR curtailment	Test and develop capabilities for GFI deployment on IBR and install GFI on renewable site to enable community microgrid	Install 88 smart reclosers to benefit more than 24,000 customers across service territory and allow for DER penetration on circuits

Project Management

DEV has established a formal Grants Office to support ACDC compliance, administration, and benefits tracking, as well as facilitate coordination across our business units and shared services teams, including human resources, economic development, workforce development, public policy, and environmental services. Our business units – and the key personnel listed below – will directly manage this work with dedicated teams for each of our four plays (i.e., GEV, DLR, DPM, GFI). Each business team has identified key delivery partners with whom they will work closely to achieve the respective scopes and objectives of ACDC.

DEV maintains systems and processes to manage risk, secure a talented workforce, and meaningfully engage with our community partners. Critical interdependencies and inflection

points will be smoothed through formal project management processes and an ACDC program coordination and governance plan, a shared IT environment, standardized cadences across our respective project managers, and with our executives.

Project changes are often inevitable on any sort of deployment at scale – we understand this and will work within the DOE compliance and reporting apparatus to ensure that changes are necessary, socialized, and undertaken effectively.

Technical Qualifications and Resources

Project Team Qualifications and Expertise

DEV is made up of thousands of professionals who prioritize safety and reliability as they serve nearly three million homes and businesses in VA and NC. The ACDC project sits within the core Transmission and Distribution business units led by Dr. Matthew Gardner and Robert Wright. The project managers for the ACDC project, who collectively have 60 years of experience, will be Dr. Kevin Jones, Manager of Electric Transmission Operations Engineering Support; Marlu Deverick, Manager of Electric Transmission Operational Engineering and Reliability Support; and Rick Siepka, Manager of Electric Distribution Grid Planning.

Dr. Kevin Jones joined DE ten years ago after receiving his Ph.D. from Virginia Polytechnic Institute & State University as a Harry Lynde Bradley Fellow in 2013 where he studied synchrophasor technology, wide area measurement systems, and linear state estimation. Jones developed the open-source Linear State Estimator, now commercialized by several industry vendors, used for improving resiliency of real-time transmission control centers. In his ten years at DEV, Jones has developed the Analysis On Demand (ANODE) platform, increasing the analytic throughput of the outage planning team by more than 1,000 times. He has championed much of DEV's synchrophasor data program over the last decade and now oversees an organization of approximately 30 engineers who focus on physics-based modeling and simulation, data-driven operations support, and engineering analysis of time-series sensor data from the electric transmission grid.

Marlu Deverick oversees DEV’s transmission equipment asset management activities. Deverick has 14 years of experience working in several engineer and management roles at DEV. In her previous role, she served as Manager of System Operations Engineering and was responsible for the successful upgrade of DEV’s EMS system, the design and development of a new synchrophasor-based system for real-time operations and initiated the integration efforts of DLR in DEV’s EMS. She also served as Supervisor of System Operations Engineering and was responsible for developing protection requirements to reliably interconnect renewable energy into our grid. Deverick is currently DEV’s Manager of EPRI Technology Transfer and a member of IEEE, the North American Transmission Forum, and the International Council on Large Electric Systems.

Rick Siepka leads DEV’s distribution grid planning efforts and is responsible for the technical and engineering aspects of DE’s electric distribution grid planning and reliability programs. Siepka has 36 years of experience working in various engineering, operational, and management

positions at DE and contributes to broader conversations around planning for the electric utilities industry and the VA community. Siepka is an advisor for EPRI's Distribution Operations and Planning research program and was honored with a 2022 EPRI technology transfer award for his collaboration on the automated distribution assessment and planning toolset (ADAPT) project. He is also a member of the Area 31 (North of the James) Special Olympics of Virginia council.

DEV's proposed partners for the ACDC project have longstanding and fruitful histories with us on a range of cutting-edge investments. This includes Mitsubishi, LineVision, GE Digital, and PingThings.

Mitsubishi is a significant provider of equipment and services to DEV, a partnership proven over many emergency response situations, enabling fast restoration times for customers. During normal operations, DEV and Mitsubishi maintain a collaborative relationship to develop and advance technologies, like our intended efforts to develop GFIs.

DEV began working with Massachusetts-based DLR technology company LineVision, and General Electric in 2017 on our DLR pilot effort. Both teaming partners built a rich collaboration centered around problem solving and transparency. When possible, DEV looks for aligned teaming structures – for instance, despite being DEV's existing EMS vendor, GE also maintains its own partnership agreement with LineVision, bolstering efforts and collaboration.

While most of the teaming partners have been identified, additional ones may emerge as we progress. We routinely open tenders for new partners who undergo significant screening of their qualifications and capabilities. For projects that require specific teaming partners due to technical innovation, we enter partnerships judiciously and with both technical reviews as well as by conducting pilots of new technologies – including those presented in this application. For example, our more recent partnership with PingThings – which provides the fastest time-series platform for utility sensing data in the world – began in 2018 as we looked to invest in large data solutions for our telemetry ambitions.

DEV is also committed to ensuring diverse suppliers and has active efforts to act on our commitments in this area. More detail can be found in the Community Benefits Plan.

Availability of Equipment and Facilities

DEV has significant experience in developing pilots and first-ever commercial deployments. This project is manageable within the capabilities of our current facilities and equipment. We maintain advanced testing facilities and digital capabilities for both hardware and software development and integration. This includes DE's leading High Voltage Laboratory in Petersburg, VA – which is one of three worldwide with similar capabilities that are in demand from our vendors and peers. Additionally, we have extensive data architecture, data lake and analytics capabilities – all of which we will leverage with ACDC.

Previous Experience and Work Efforts

The project managers mentioned above and the teams they oversee have been leading DEV's exploration and/or roll out of each of these technologies. In the "Project Development Efforts to Date" section above, we have chronicled the history of our experience with these ACDC and adjacent capabilities, which cover more than 20 years of innovation and deployment experience. To pick one example of our four technologies that led to greater deployment insights, which we will leverage with ACDC: we have explored various use cases with DLR and other line sensor systems since 2014. We have explored a range of locations, from coastal to mountainous areas to better understand how these systems perform in harsh environments with various elements from strong winds to corrosive salt. We have also experimented with various DLR form factors from pole to line mounted systems leading to the determination that pole mounted systems are faster, easier, and safer to perform maintenance on. Whether it is from these pilot learnings or the myriad others we have conducted, our teams are ready to vary their variables to find the right set of tools and capabilities we need for flexible grid management – and then scale them as if our energy transition and grid stability depends on it.

Time Commitment

Each of the above-named Key/Senior Personnel will be fully dedicated to ACDC. They will be backfilled by a mix of veteran engineers and supervisors who will assume their current duties, freeing them and others as indicated in our attached Budget Justification worksheet – to focus on executing the proposed activities. They will be supported by a range of enterprise service personnel for grant compliance and Distribution and Transmission business unit leadership, who have conducted a detailed staffing exercise to define and determine the number of internal and external support staff needed to execute this work with the qualifications, commitment, and groundbreaking gusto it demands.

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: TA2-149-E Proposer: Virginia Electric and Power Company, Inc
2. This Environmental Questionnaire pertains to a: ☒ Recipient or Prime Contractor ☐ Sub-recipient or Subcontractor
3. Principal Investigator: Amanda Prestage Telephone Number: 804.771.4416
4. Project Title: Analytics and Control for Driving Capital Efficiency (ACDC)
5. Expected Project Duration: January 2024-December 2028
6. Location of Activities covered by **this** Environmental Questionnaire: (City/Township, County, State):
   multiple locations across Virginia and North Carolina
7. List the full scope of activities planned (only for the location that is the subject of this Environmental Questionnaire).
   Grid Edge Visibility is replacing legacy devices with microprocessor controlled devices with telemetry capability; Additional sensor installation within existing control houses/boxes; Grid Forming Inverter device installed within a microgrid.
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
none	none

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.

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.

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Group B

☐ 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.

There are no alternatives to the proposed approaches.

C. PROJECT LOCATION

1. Provide a brief description of the project location (physical location, surrounding area, adjacent structures).

Multiple locations, most activities within existing substation control enclosures and existing communication infrastructure hardware.

2. **Attach** a project site location map of the project work area.

See attached GIS map.

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	☑ Residential	☐ Research Facilities
☐ 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.

Most work would be contained in substation control enclosures or on existing communication infrastructure hardware and would be limited to addition of devices on existing panels or firmware upgrades or replacement of existing devices.

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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.

☑ No construction would be anticipated for this project.

Typical projects may require replacement of an existing pole within the same location. Minimal land disturbance.

d. Describe how land use would be affected by operational activities associated with the proposed project.

☑ No land areas would be affected.

e. Describe any plans to reclaim areas that would be affected by the proposed project.

☑ No land areas would be affected.

f. Would the proposed project affect any unique or unusual landforms (e.g., cliffs, waterfalls, etc.)?

☑ 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? ☑ 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. ☐ None

See attached GIS map.

b. Would the proposed project require the construction of waste pits or settling ponds?

☑ No ☐ Yes (describe and identify location, and estimate surface area disturbed)

c. Would the proposed project affect any existing body of water? ☑ No ☐ Yes (describe)

Projects will be designed to avoid and minimize impacts to jurisdictional waters. Unavoidable impacts will be coordinated with appropriate regulatory agencies.

d. Would the proposed project impact a floodplain or wetland? ☑ No ☐ Yes (describe)

Projects will be designed to avoid and minimize impacts to floodplains or wetlands. Unavoidable impacts will be coordinated with appropriate regulatory agencies.

e. Would the proposed project potentially cause runoff/sedimentation/erosion? ☑ No ☐ Yes (describe)

Proper erosion and sediment as well as stormwater management measures will be implemented. Any applicable local and state authorizations will be obtained as required.

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?

☑ No ☐ Yes (describe)

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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?
☑ 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.
☑ None

Project is not expected to result in adverse impacts to regulated species. However, the company will coordinate with state and federal agencies as appropriate prior to mobilization

b. Would any designated critical habitat be affected by the proposed project? ☑ No ☐ Yes (describe)

Project is not expected to result in adverse impacts to critical habitat. However, the company will coordinate with state and federal agencies as appropriate prior to mobilization

c. Describe any impacts that construction would have on any other types of sensitive or unique habitats.
☐ No planned construction ☐ No habitats ☑ None ☐ Impact (describe)

Project is not expected to result in adverse impacts to sensitive habitat. However, the company will coordinate with state and federal agencies as appropriate prior to mobilization

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? ☑ No ☐ Yes (describe)

e. Would any migratory animal corridors be impacted or disrupted by the proposed project? ☑ No ☐ Yes (describe)

4. Socioeconomic and Infrastructure Conditions

a. Would local socio-economic changes result from the proposed project? ☑ No ☐ Yes (describe)

b. Would the proposed project generate increased traffic use of roads through local neighborhoods, urban or rural areas?
☑ No ☐ Yes (describe)

c. Would the proposed project require new transportation access (roads, rail, etc.)? Describe location, impacts, costs.
☑ No ☐ Yes (describe)

d. Would the proposed project create a significant increase in local energy usage? ☑ No ☐ Yes (describe)

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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. ☑ None

Historical, archaeological, or cultural sites are not expected in the vicinity of the proposed project but, if applicable, will be identified prior to mobilization.

b. Would construction or operational activities planned under the proposed project disturb any historical, archaeological, or cultural sites? ☐ No planned construction ☐ No historic sites ☐ Yes (describe) ☑ No Impact (discuss)

Historical, archaeological, or cultural sites are not expected to be impacted by construction or operation. Coordination with regulatory agencies will be conducted as needed

c. Has the State Historic Preservation Office been contacted with regard to this project? ☑ No ☐ Yes (describe)

d. Would the proposed project interfere with visual resources (e.g., eliminate scenic views) or alter the present landscape?
☑ 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.

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	☐	☑
O_3 - 8 Hour	☐	☑
SO_x	☑	☐
PM - 2.5	☑	☐
PM - 10	☑	☐
CO	☑	☐
NO_2	☑	☐
Lead	☑	☐

b. Would proposed project require issuance of new or modified local, state, or federal air permits to perform project related work and activities? ☑ No ☐ Yes (describe)

c. Would the proposed project be in compliance with local and state air quality requirements? ☑ 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?
☑ 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:		
☐ None		

f. Would any types of emission control or particulate collection devices be used?
☑ No ☐ Yes (describe, including collection efficiencies)

g. How would emissions be vented?

7. Hydrologic Conditions/Water Quality

a. What nearby water bodies may be affected by the proposed project? Provide distance(s) from the project site.

Project will be designed to avoid and minimize impacts to jurisdictional waters. Unavoidable impacts will be coordinated with appropriate regulatory agencies.

b. What sources would supply potable and process water for the proposed project?

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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:		
☑ None		

d. What would be the major components of each type of wastewater (e.g., coal fines)? ☑ No wastewater produced

e. Identify the local treatment facility that would receive wastewater from the proposed project.
☑ No discharges to local treatment facility

f. Describe how wastewater would be collected and treated. ☑ No wastewater produced

g. Would any run-off or leachates be produced from storage piles or waste disposal sites? ☑ No ☐ Yes (describe source)

h. Would project require issuance of new or modified water permits to perform project work or site development activities?
☑ No ☐ Yes (describe)

i. Where would wastewater effluents from the proposed project be discharged? ☑ No wastewater produced

j. Would the proposed project be permitted to discharge effluents into an existing body of water?
☑ No ☐ Yes (describe water use and effluent impact)

k. Would a new or modified National Pollutant Discharge Elimination System (NPDES) permit be required?
☑ No ☐ Yes (describe)

l. Would the proposed project adversely affect the quality or movement of groundwater? ☑ No ☐ Yes (describe)

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m. Would the proposed project require issuance of an Underground Injection Control (UIC) permit?
☑ 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)?
☑ 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:** non-haz industrial waste	minimal
☐ **Hazardous waste – Identify:**	
☐ **None**	

b. Would project require issuance of new or modified solid waste and/or hazardous waste related permits to perform project work activities? ☑ No ☐ Yes (explain)

Solid wastes generated would be disposed only at facilities DEV has approved for disposal. DEV has a central waste operations group that evaluates disposal facilities.

c. How and where would solid waste disposal be accomplished?
☐ 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?

Wastes would be transported for disposal in accordance with all State waste rules and US DOT rules.

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. ☑ None

f. How would hazardous or toxic waste be collected and stored? ☑ None used or produced

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g. If hazardous wastes would require off-site disposal, have arrangements been made with a certified TSD (Treatment, Storage, and Disposal) facility?

☐ Not required ☑ Arrangements not yet made ☐ Arrangements made with a certified TSD facility (identify)

DEV has agreements with waste disposal companies that meet DEV's standards. Approval may only be requested once the nature of the waste is known subsequent to generation event.

9. Health/Safety Factors

a. Identify hazardous or toxic materials that would be used in the proposed project.

☑ 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.

☑ None

c. Would there be any special physical hazards or health risks associated with the project? ☑ No ☐ Yes (describe)

d. Does a worker safety program exist at the location of the proposed project? ☑ No ☐ Yes (describe)

e. Would additional safety training be necessary for any new laboratory, equipment, or processes involved with the project?

☑ No ☐ Yes (describe)

f. Describe any increases in ambient noise levels to the public from construction and operational activities.

☑ 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?

☑ No construction planned ☐ No ☐ Yes (describe)

h. Would hearing protection be required for workers? ☑ 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?

☑ No ☐ Yes (describe)

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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? ☑ No ☐ Yes (describe)

c. Would the proposed project involve operations of environmental monitoring and control systems?
☑ 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? ☑ 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): ☑ None ☐ New Required ☐ Modification Required
Describe:

b. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA):
☑ None ☐ New Required ☐ Modification Required
Describe:

c. Toxic Substance Control Act (TSCA): ☑ None ☐ New Required ☐ Modification Required
Describe:

d. Clean Water Act (CWA): ☑ None ☐ New Required ☐ Modification Required
Describe:
Authorizations required for Erosion and Sediment Control, Stormwater Management, or unavoidable impacts to wetlands or waterways will be obtained as appropriate.

e. Underground Storage Tank Control Program (UST): ☑ None ☐ New Required ☐ Modification Required
Describe:

f. Underground Injection Control Program (UIC): ☑ None ☐ New Required ☐ Modification Required
Describe:

g. Clean Air Act (CAA): ☑ None ☐ New Required ☐ Modification Required
Describe:

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h. Endangered Species Act (ESA): ☑ None ☐ New Required ☐ Modification Required
Describe:

Agency coordination required for potential impacts to regulated species or habitat will be conducted as appropriate.

i. Floodplains and Wetlands Regulations: ☑ None ☐ New Required ☐ Modification Required
Describe:

Agency coordination required for unavoidable impacts to listed resources will be conducted as appropriate.

j. Fish and Wildlife Coordination Act (FWCA): ☑ None ☐ New Required ☐ Modification Required
Describe:

Agency coordination required for potential impacts to regulated species or habitat will be conducted as appropriate.

k. National Historic Preservation Act (NHPA): ☑ None ☐ New Required ☐ Modification Required
Describe:

Agency coordination required for unavoidable impacts to listed resources will be conducted as appropriate.

l. Coastal Zone Management Act (CZMA): ☑ None ☐ New Required ☐ Modification Required
Describe:

Agency coordination required for activities planned in regulated areas will be conducted as appropriate.

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. ☑ None

No issues identified at this time.

G. WOULD THE PROPOSED PROJECT PRODUCE ADDITIONAL DEVELOPMENT, OR ARE OTHER MAJOR DEVELOPMENTS PLANNED OR UNDERWAY, IN THE PROJECT AREA?

☑ No ☐ Yes (describe)

H. SUMMARIZE THE SIGNIFICANT IMPACTS THAT WOULD RESULT FROM THE PROPOSED PROJECT.

☑ None (provide supporting detail) ☐ Significant impacts (describe)

ACDC's only physical impact is the deployment of or modification of sensors and devices in existing electrical and communications infrastructure. The infrastructure does not need to be significantly modified to accommodate the changes. The rest of the project is focused on software development and data analytics leveraging the data generated by the sensors.

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.

Sensors and devices will be replaced at end of life. Solid wastes generated would be disposed only at facilities DEV has approved for disposal. DEV has a central waste operations group that evaluates disposal facilities.

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: Amanda K. Prestage Date (mm/dd/yyyy): 03/06/2023

Typed Name: Amanda Prestage

Title: General Manager - Corp Strategic Planning

Organization: Auth. Rep. VA Electric and Power Company

IV. REVIEW AND APPROVAL BY DOE

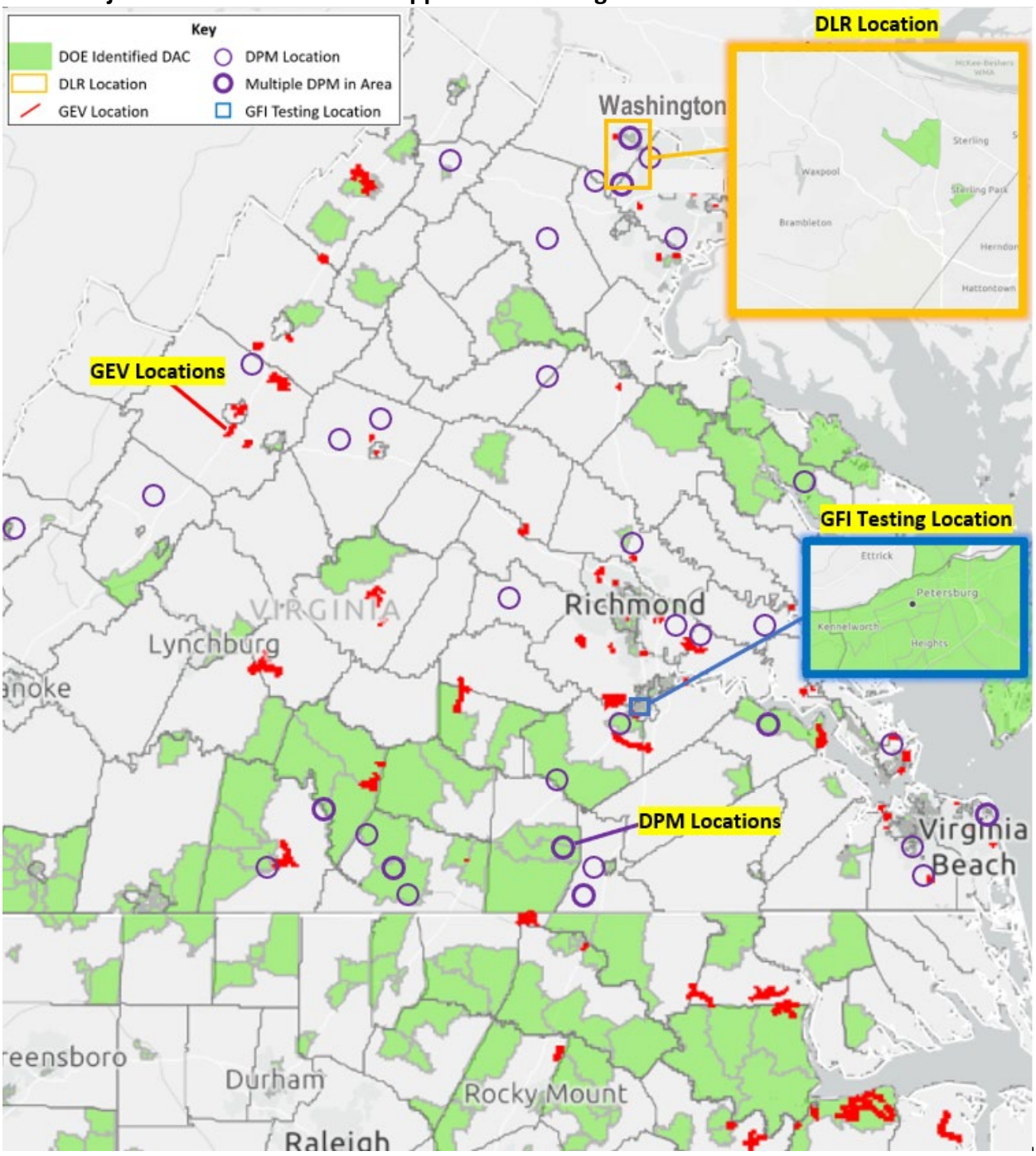
I hereby certify that I have reviewed the information provided in this questionnaire, have determined that all questions have been appropriately answered, and judge the responses to be consistent with the efforts proposed.

DOE Project Manager

Signature: Date (mm/dd/yyyy):

Typed Name:

ACDC Project Locations with DOE Mapped Disadvantaged Communities



Locations of Work (DE-FOA-0002740)				
Prime or Sub	**Name**	**City**	**State**	**Zip Code + 4**
Prime	Virginia Electric and Power Company	AHOSKIE	NC	27910-8825
Prime	Virginia Electric and Power Company	ALDIE	VA	20105-5880
Prime	Virginia Electric and Power Company	ALEXANDRIA	VA	22304-1535
Prime	Virginia Electric and Power Company	APPOMATTOX	VA	24522-5224
Prime	Virginia Electric and Power Company	ASHBURN	VA	20147-4411
Prime	Virginia Electric and Power Company	ASHLAND	VA	23005-7940
Prime	Virginia Electric and Power Company	ASHLAND	VA	23005-3421
Prime	Virginia Electric and Power Company	ASHLAND	VA	23005-0000
Prime	Virginia Electric and Power Company	AULANDER	NC	27805-9669
Prime	Virginia Electric and Power Company	BARHAMSVILLE	VA	23011-0000
Prime	Virginia Electric and Power Company	BOYDTON	VA	23917-0000
Prime	Virginia Electric and Power Company	BOYDTON	VA	23917-3742
Prime	Virginia Electric and Power Company	BOYDTON	VA	23917-4008
Prime	Virginia Electric and Power Company	BRIDGEWATER	VA	22812-3526
Prime	Virginia Electric and Power Company	CHANTILLY	VA	20152-1357
Prime	Virginia Electric and Power Company	CHANTILLY	VA	20152-1389
Prime	Virginia Electric and Power Company	CHARLES CITY	VA	23030-0000
Prime	Virginia Electric and Power Company	CHARLES CITY	VA	23030-2540
Prime	Virginia Electric and Power Company	CHARLOTTESVILLE	VA	22901-8911
Prime	Virginia Electric and Power Company	CHARLOTTESVILLE	VA	22903-4580
Prime	Virginia Electric and Power Company	CHARLOTTESVILLE	VA	22901-1918
Prime	Virginia Electric and Power Company	CHARLOTTESVILLE	VA	22911-0000
Prime	Virginia Electric and Power Company	CHASE CITY	VA	23924-2825
Prime	Virginia Electric and Power Company	CHASE CITY	VA	23924-0000
Prime	Virginia Electric and Power Company	CHESAPEAKE	VA	23321-2134
Prime	Virginia Electric and Power Company	CHESAPEAKE	VA	23321-5213
Prime	Virginia Electric and Power Company	CHESAPEAKE	VA	23322-2396
Prime	Virginia Electric and Power Company	CHESAPEAKE	VA	23322-0000
Prime	Virginia Electric and Power Company	CHESAPEAKE	VA	23323-6203
Prime	Virginia Electric and Power Company	CHESTER	VA	23836-2461
Prime	Virginia Electric and Power Company	CHESTERFIELD	VA	23832-8043

Prime	Virginia Electric and Power Company	CLIFTON	VA	20124-2302
Prime	Virginia Electric and Power Company	COLERAIN	NC	27924-9481
Prime	Virginia Electric and Power Company	COLUMBIA	NC	27925-9445
Prime	Virginia Electric and Power Company	COVINGTON	VA	24426-0000
Prime	Virginia Electric and Power Company	CRESWELL	NC	27928-8856
Prime	Virginia Electric and Power Company	CREWE	VA	23930-2317
Prime	Virginia Electric and Power Company	DILLWYN	VA	23936-2446
Prime	Virginia Electric and Power Company	DILLWYN	VA	23936-2621
Prime	Virginia Electric and Power Company	DILLWYN	VA	23936-3354
Prime	Virginia Electric and Power Company	DULLES	VA	20166-2437
Prime	Virginia Electric and Power Company	EDINBURG	VA	22824-2932
Prime	Virginia Electric and Power Company	EMPORIA	VA	23847-5714
Prime	Virginia Electric and Power Company	FALLS CHURCH	VA	22042-2559
Prime	Virginia Electric and Power Company	FREDERICKSBURG	VA	22407-4900
Prime	Virginia Electric and Power Company	FREDERICKSBURG	VA	22408-2608
Prime	Virginia Electric and Power Company	FREEMAN	VA	23856-2452
Prime	Virginia Electric and Power Company	FRONT ROYAL	VA	22630-7273
Prime	Virginia Electric and Power Company	GLEN ALLEN	VA	23060-3308
Prime	Virginia Electric and Power Company	GLEN ALLEN	VA	23060-3315
Prime	Virginia Electric and Power Company	GROTTOES	VA	24441-4600
Prime	Virginia Electric and Power Company	GUM SPRING	VA	23065-2263
Prime	Virginia Electric and Power Company	HALIFAX	VA	24558-2657
Prime	Virginia Electric and Power Company	HAMPTON	VA	23669-1765
Prime	Virginia Electric and Power Company	HAMPTON	VA	23669-4680
Prime	Virginia Electric and Power Company	HAMPTON	VA	23666-0000
Prime	Virginia Electric and Power Company	HARRISONBURG	VA	22802-4632
Prime	Virginia Electric and Power Company	HENRICO	VA	23228-2665
Prime	Virginia Electric and Power Company	HENRICO	VA	23231-5002
Prime	Virginia Electric and Power Company	HENRICO	VA	23233-1936
Prime	Virginia Electric and Power Company	HENRICO	NC	27842-7508
Prime	Virginia Electric and Power Company	HENRICO	NC	27842-9431
Prime	Virginia Electric and Power Company	HERNDON	VA	20171-3715
Prime	Virginia Electric and Power Company	HERNDON	VA	20194-0000
Prime	Virginia Electric and Power Company	HOPEWELL	VA	23860-0000

Prime	Virginia Electric and Power Company	HOPEWELL	VA	23860-2413
Prime	Virginia Electric and Power Company	HOPEWELL	VA	23860-7826
Prime	Virginia Electric and Power Company	JAMESVILLE	NC	27846-9243
Prime	Virginia Electric and Power Company	KEYSVILLE	VA	23947-3655
Prime	Virginia Electric and Power Company	LOCUST GROVE	VA	22508-0000
Prime	Virginia Electric and Power Company	LORTON	VA	22079-2609
Prime	Virginia Electric and Power Company	MANASSAS	VA	20110-0000
Prime	Virginia Electric and Power Company	MIDLOTHIAN	VA	23112-4926
Prime	Virginia Electric and Power Company	NORTH CHESTERFIELD	VA	23237-2297
Prime	Virginia Electric and Power Company	NORTH DINWIDDIE	VA	23803-2702
Prime	Virginia Electric and Power Company	NORTH DINWIDDIE	VA	23805-9631
Prime	Virginia Electric and Power Company	NORTH DINWIDDIE	VA	23805-9634
Prime	Virginia Electric and Power Company	NORTH PRINCE GEORGE	VA	23860-8204
Prime	Virginia Electric and Power Company	PENN LAIRD	VA	22846-2045
Prime	Virginia Electric and Power Company	PETERSBURG	VA	23805-8914
Prime	Virginia Electric and Power Company	PETERSBURG	VA	23805-8905
Prime	Virginia Electric and Power Company	PLYMOUTH	NC	27962-2008
Prime	Virginia Electric and Power Company	PLYMOUTH	NC	27962-8908
Prime	Virginia Electric and Power Company	POQUOSON	VA	23662-2132
Prime	Virginia Electric and Power Company	POWHATAN	VA	23139-4820
Prime	Virginia Electric and Power Company	RANDOLPH	VA	23962-0000
Prime	Virginia Electric and Power Company	RESTON	VA	20190-5318
Prime	Virginia Electric and Power Company	RICHMOND	VA	23219-3852
Prime	Virginia Electric and Power Company	RICHMOND	VA	23219-4306
Prime	Virginia Electric and Power Company	RICHMOND	VA	23224-3525
Prime	Virginia Electric and Power Company	RICHMOND	VA	23226-1907
Prime	Virginia Electric and Power Company	RICHMOND	VA	23227-1306
Prime	Virginia Electric and Power Company	RICHMOND	VA	23234-2221
Prime	Virginia Electric and Power Company	RICHMOND	VA	23250-2416
Prime	Virginia Electric and Power Company	ROANOKE RAPIDS	NC	27870-3300
Prime	Virginia Electric and Power Company	ROANOKE RAPIDS	NC	27870-5011
Prime	Virginia Electric and Power Company	ROCKBRIDGE BATHS	VA	24473-0000
Prime	Virginia Electric and Power Company	SANDSTON	VA	23150-0000
Prime	Virginia Electric and Power Company	SKIPPERS	VA	23879-0000

Prime	Virginia Electric and Power Company	SKIPPERS	VA	23879-2116
Prime	Virginia Electric and Power Company	SMITHFIELD	VA	23430-1221
Prime	Virginia Electric and Power Company	SMITHFIELD	VA	23430-5548
Prime	Virginia Electric and Power Company	SOUTH BOSTON	VA	24592-0000
Prime	Virginia Electric and Power Company	SOUTH CHESTERFIELD	VA	23803-1301
Prime	Virginia Electric and Power Company	SOUTH CHESTERFIELD	VA	23803-1436
Prime	Virginia Electric and Power Company	SOUTH CHESTERFIELD	VA	23803-6401
Prime	Virginia Electric and Power Company	SOUTH HILL	VA	23970-3425
Prime	Virginia Electric and Power Company	SPRING GROVE	VA	23881-7824
Prime	Virginia Electric and Power Company	STAUNTON	VA	24401-5533
Prime	Virginia Electric and Power Company	STAUNTON	VA	24401-6824
Prime	Virginia Electric and Power Company	STAUNTON	VA	24401-9022
Prime	Virginia Electric and Power Company	STAUNTON	VA	24401-9051
Prime	Virginia Electric and Power Company	STERLING	VA	20166-0000
Prime	Virginia Electric and Power Company	SUFFOLK	VA	23435-4120
Prime	Virginia Electric and Power Company	SURRY	VA	23883-2003
Prime	Virginia Electric and Power Company	SURRY	VA	23883-2040
Prime	Virginia Electric and Power Company	VIRGINIA BEACH	VA	23452-7318
Prime	Virginia Electric and Power Company	VIRGINIA BEACH	VA	23454-6731
Prime	Virginia Electric and Power Company	VIRGINIA BEACH	VA	23455-2108
Prime	Virginia Electric and Power Company	VIRGINIA BEACH	VA	23451-6110
Prime	Virginia Electric and Power Company	VIRGINIA BEACH	VA	23454-5870
Prime	Virginia Electric and Power Company	WARFIELD	VA	23889-2115
Prime	Virginia Electric and Power Company	WARRENTON	VA	20187-0000
Prime	Virginia Electric and Power Company	WARSAW	VA	22572-3572
Prime	Virginia Electric and Power Company	WEST POINT	VA	23181-0000
Prime	Virginia Electric and Power Company	WEYERS CAVE	VA	24486-0000
Prime	Virginia Electric and Power Company	WHITAKERS	NC	27891-9288
Prime	Virginia Electric and Power Company	WILLIAMSBURG	VA	23185-3501
Prime	Virginia Electric and Power Company	WILLIAMSBURG	VA	23188-2873
Prime	Virginia Electric and Power Company	WILLIAMSTON	NC	27892-2474
Prime	Virginia Electric and Power Company	WOODBRIDGE	VA	22191-1502
Prime	Virginia Electric and Power Company	WOODBRIDGE	VA	22193-4713
Prime	Virginia Electric and Power Company	WOODSTOCK	VA	22664-2084

GEORGE MASON UNIVERSITY

Office of the President

4400 University Drive, Fairfax, Virginia 22030
Phone: 703-993-6895

March 13, 2023

To Whom It May Concern:

Dominion Energy Virginia (DEV) is pursuing critical grid modernization projects to and will require a well-trained and skilled workforce to carry out their plan. They have shared with us both their IIJA ambition as well as their broader grid modernization plans. George Mason University (Mason) has made deep investments in building the academic pathways that will underpin this work, with skilled professionals from power systems engineering to physical systems cybersecurity. Ranked #7 in Diversity and #8 in Innovation in the nation for public universities, Mason is Virginia's leading educator and researcher in energy security, climate change, and resilience innovation. As the largest university in Virginia, we believe the future of smart energy comes from embedding energy concepts in multiple degree pathways, retaining world-class researchers in these topic areas and building a diverse, talented workforce to meet the current and anticipated talent needs. For years, we have partnered with DEV inspiring the next generation of grid operators and innovators through career fairs, minority and underrepresented student group recruiting, scholarship funds, across our STEM faculty and student body.

Given the expected job growth created by IIJA awards, as well as the billions being invested across Virginia in resilient infrastructure and energy security, Mason will be:

- Expanding our Center for Smart Grid research and capabilities
- Increasing our focus on power systems engineering courses and degree pathways for undergraduate and graduate students
- Increasing Dominion-specific recruiting efforts, to include heavier recruiting fair presence, career day discussions, regular communication of job opportunities and formal sharing of annual assessment of talent/skilling needs against anticipated job openings
- Increasing Dominion internship minority and disadvantaged community recruiting efforts through the Promesa: Hispanic Higher Education Initiative partnership and other Dominion scholarships
- Expanding our partnership with Dominion on our Early Identification Program, a program for high school students that provides year-round academic enrichment, personal and social development, civic engagement, and leadership training opportunities for middle and high school college-bound first-generation college students
- Leveraging our Advance program with Northern Virginia Community College to build stronger pathways to energy careers

George Mason University is enthusiastic to continue and deepen our partnership with DEV to prepare the next generation of research and workforce to ensure future energy security and innovation.

Sincerely,

Megan Healy PhD
Special Advisor to the President

CYEP
Capital Youth Empowerment Program

950 N. Washington Street
STE 350
Alexandria, VA 22314
www.cyep.org
eking@cyep.org

March 6, 2023

David Crane
Director, Office of Clean Energy Demonstrations
Department of Energy
1000 Independence Ave., SW
Washington, DC 20585

Dear Mr. Crane:

We at the Capital Youth Empowerment Program (CYEP) are excited about the potential funding available through the Grid Resilience and Innovative Partnerships Grants (GRIP) program. We are committed to partnering with the ACDC project to promote workforce development, particularly for underserved populations. We believe that by unlocking the potential of underserved youth and fathers, we can help create a more resilient and reliable grid while also promoting equity in our community.

CYEP is a unifying force in the National Capital region that connects industries to disenfranchised families and fathers to the needs of the community. We recognize the importance of the ACDC project and the impact it will have on our community, specifically regarding job creation and training opportunities for underserved populations.

We are excited to partner with Dominion to promote the jobs available through this project to our participants and provide support in the form of workforce development and training programs. We are particularly interested in supporting the ACDC project through our Project Success and the Fathers-in-Tech Program.

Our Project Success program engages youth and promotes positive youth empowerment and healthy lifestyle choices, including STEM education and mental health awareness. The Fathers-in-Tech Program takes a unique approach to social interventions and workforce skills development to help fathers increase the quality of their interactions with their children and loved ones while also providing economic growth and family empowerment opportunities.

CYEP will leverage our industry partners and academic institutions to promote job opportunities and provide training resources to our community. We will also support outreach efforts to disenfranchised populations and provide assistance in promoting the ACDC project to the broader community.

Thank you for your time and consideration.

Sincerely,

Erick King
Executive Director and Co-Founder
Capital Youth Empowerment Program (CYEP)

Mr. David Crane
Director, Office of Clean Energy Demonstrations
Department of Energy
1000 Independence Ave., SW
Washington, DC 20585

Virginia Asian Chamber of Commerce
"Your Gateway to Economic Opportunity."

Dear Director Crane:

We at the Virginia Asian Chamber of Commerce are pleased to offer our commitment to Dominion Energy Virginia's (DEV) Analytics and Control for Driving Capital Efficiency project (ACDC) grant application. We are excited about the potential for this project to accelerate clean energy efforts and improve the resilience and reliability of the grid for customers and businesses across Virginia. The technology investments proposed through ACDC will enable a more nimble and efficient electricity system that can deliver on the demands of a cleaner, safer, more reliable, distributed, and affordable grid for the 21st century.

As a partner in this project, the Virginia Asian Chamber of Commerce is committed to leveraging our extensive network of members to support the supply chain needs for this project, help to promote employment pathways related to its implementation, and serve as a liaison to community members. We believe that our participation in this project is critical to its success and will help to drive progress towards a cleaner, more sustainable energy future for our region.

We understand that the success of this project depends on the participation of a broad range of stakeholders, and we are committed to doing our part to ensure its success. We are confident that the ACDC project will prepare Dominion Energy Virginia for the next century of energy transition.

We look forward to working with you and the Department of Energy to bring this project to fruition and to help drive progress towards a cleaner, more sustainable energy future for our region and the Commonwealth.

Sincerely,

My Lan Tran

Ms. My Lan Tran, CED, CIT, CVET
Executive Director, Virginia Asian Chamber of Commerce
E: mylantran@aabac.org * T: 804 502 8081 * www.aabac.org

Northern Virginia Regional Commission

3040 Williams Drive | Suite 200 | Fairfax, VA 22031
p: 703-642-0700 | f: 703-642-5077
www.novaregion.org

March 1, 2023

Mr. David Crane
Director, Office of Clean Energy Demonstrations
1000 Independence Ave, SW
Washington, DC 20585

Dear Mr. Crane,

The Northern Virginia Regional Commission is pleased to express its support for Dominion Energy Virginia's (DEV) IIJA Analytics & Control for Driving Capital (ACDC) grant application.

.

DEV is pursuing critical grid modernization projects to accelerate energy transition and achieve job creation in the energy industry. We support these projects and are excited that a substantial portion of the ACDC investments is in Northern Virginia. As you know, DEV is committed to 100% clean electricity generation by 2045 and modernizing the grid is critical to ensuring a smooth transition to these sources.

As you know, Northern Virginia is the largest region in the Commonwealth of Virginia with more than 2.5 million residents. Nearly 50% of the growth in population of the Commonwealth between the 2010 and 2020 Census was in our region. As such electricity demand has grown substantially over the years.

Northern Virginia is the economic engine of the Commonwealth with a GDP of $251 Billion. That GDP is larger than 26 states and if a country would be the 46th largest economy in the world. As such, a reliable grid is incredibly important to a region that contributes nearly 42% of the Commonwealth's economy. Further, Northern Virginia is home to critical internet infrastructure with more than 70% of the world's internet traffic flowing through the data centers in our region.

DEV's energy transition goals broadly and ACDC's objectives specifically align with the climate roadmap of our Commission and those of the 13 local governments we represent. Northern Virginia is home to ~128,000 minority-owned business, representing roughly 40% of all businesses in the region. Each depend on affordable and reliable energy to operate. The communities we represent strive to keep that accessible, equitable energy flow coming – and continuously push for a greener, cleaner grid through our respective Energy and Climate Action plans. Partnership with DEV is essential to a sustainable, healthier future for our region.

We have a history of collaboration with DEV and will help socialize the benefits of the DOE investments within our communities, promoting energy industry career pathways to students, and amplifying job posting and recruitment efforts through our workforce development channels.

We urge DOE to invest in DEV's ACDC projects, and we are excited to working with DEV on this important investment in our climate and our communities.

Sincerely,

Robert W. Lazaro, Jr.
Executive Director

VIRGINIA
CAREER WORKS

NORTHERN REGION

Fairfax County | Prince William County | Loudoun County | City of Fairfax | City of Falls Church | City of Manassas | City of Manassas Park

March 6, 2023

Mr. David Crane
Director, Office of Clean Energy Demonstrations
U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585

Dear Mr. Crane:

Virginia Career Works Northern is excited to partner with Dominion Energy Virginia (DEV) on the Analytics & Control for Driving Capital (ACDC) project. This Project will have significant economic and environmental benefits for the Commonwealth of Virginia, and we are committed to playing an active role in supporting its success.

Our team of private and public sector partners shares a common goal of promoting economic prosperity and long-term growth in Northern Virginia. As an administrator of annual Federal Workforce Innovation and Opportunity Act (WIOA) funding, we are well-positioned to provide comprehensive employment and training services to Northern Virginia employers, job seekers, and youth.

We commit to actively partnering with DEV on its recruitment efforts for the ACDC project, and our team will work closely with DEV to identify workforce needs. Through this Partnership, we will ensure that the benefits of the ACDC project extend beyond the project itself and reach individuals and communities throughout Northern Virginia. We are excited to be part of this important initiative and look forward to working with Dominion Energy to make it a success.

Sincerely,

David Hunn
Executive Director

February 23, 2023

Dear Director David Crane:

Virginia Clean Cities enthusiastically supports Dominion Energy Virginia's (DEV) IIJA Analytics & Control for Driving Capital (ACDC) grant application.

Virginia Clean Cities (VCC) is a statewide clean fuel vehicle coalition, recognized and designated by the U.S. Department of Energy working to transition to a range of clean fuel technologies including supporting consumer transition to electrification of transportation. VCC is tracking and interested in a reliable grid for all consumers and seeks to see successful pilots of technology in areas of technology adoption.

DEV's proposed $66M partnership with DOE to deploy sensing capabilities across its service territory, generally, and in Northern Virginia, in particular, uses innovative technology to support the sharp increase in load growth in the region to effectively help manage and control the grid of the future. The project will also accelerate the successful deployment of solar, wind, and other distributed energy resources, allowing for a quicker energy transition and producing clean energy sooner for our community. This is helpful as the geography is an early-adoption market for electric vehicles.

Virginia Clean Cities values DEV's outreach on this project. In support ACDC and to ensure benefits of the project flow to our community, we will work closely with DEV and recognize that communications from utilities and tracking grid status is also critical for all communities. VCC is interested in supporting a successful application with contact resources or convening opportunities including having DEV speak on webinars and present materials at conferences.

We look forward to working with the Dominion on this important investment in our grid.

Sincerely,

Alleyn Harned
Executive Director,
Virginia Clean Cities
www.vacleancities.org

NVTC
NORTHERN VIRGINIA TRANSPORTATION COMMISSION

March 3, 2023

Mr. David Crane
Director, Office of Clean Energy Demonstrations
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Subject: Dominion Energy Virginia's Grid Resilience and Innovation Partnership (GRIP) Grant Application

Dear Director Crane:

The Northern Virginia Transportation Commission (NVTC) supports Dominion Energy Virginia (DEV) in its application for $66 million through the Grid Resilience and Innovation Partnership (GRIP) Smart Grid program. DEV's Analytics & Control for Driving Capital (ACDC) project is critical to the transit sector, especially in the Northern Virginia region, as it transitions to zero-emission buses (ZEBs) powered by the electric distribution grid.

NVTC serves as a regional forum for discussion and analysis of transit issues that are critically important to our economy and quality of life. Because Northern Virginia is home to six bus systems, NVTC works across jurisdictional boundaries to coordinate transit service. Most recently, this coordination has focused on aligning the zero-emission transition plans of these agencies into a regional ZEB strategic plan.

Planning for ZEBs, especially battery electric buses, requires close coordination with electric utilities like Dominion Energy Virginia. As our ZEB fleets continue to grow throughout the region, agencies are retrofitting facilities with new charging infrastructure. Dominion Energy Virginia's proposed investments will help support our region by deploying innovative technology to support the sharp increase in load growth and effectively manage and control the grid of the future. The project will also accelerate the successful deployment of solar, wind, and other distributed energy resources, allowing for a quicker energy transition and producing clean energy sooner for our community.

NVTC looks forward to collaborating further with Dominion Energy Virginia as we develop a regional ZEB strategic plan and as Dominion Energy Virginia moves forward with its grid investments.

Sincerely,

Dalia Palchik

Dalia Palchik
Chair

2300 Wilson Boulevard, Suite 230 · Arlington, VA 22201
Tel (703) 524-3322 · Fax (703) 524-1756
www.novatransit.org · Twitter @novatransit · www.facebook.com/novatransit

VIRGINIA TRANSIT ASSOCIATION
1108 East Main St., Suite 1108, Richmond, VA 23219 (804) 643-1166 Fax: (804) 643-1155

March 2, 2023

Mr. David Crane
Director, Office of Clean Energy Demonstrations
Department of Energy
1000 Independence Avenue; SW
Washington, DC 20585

Dear Director Crane:

On behalf of the Virginia Transit Association (VTA), the professional association of Virginia's transit providers, I write in support of Dominion Energy Virginia's (DEV) IIJA Analytics & Control for Driving Capital (ACDC) grant application.

These investments will help our communities by deploying innovative technology to support the sharp increase in load growth in our region and to effectively manage and control the grid of the future. The project will also accelerate the successful deployment of solar, wind, and other distributed energy resources, allowing for a quicker energy transition and producing clean energy sooner for our community. The project is critical for the transit sector as it transitions to zero emission buses powered by the electric distribution grid.

VTA values the ongoing partnership with DEV in its support for transit electrification in the Commonwealth and our mutual efforts to reduce the carbon footprint of the Commonwealth's transportation network.

To ensure benefits of the project flow to our communities, VTA will continue to provide education to our transit agency members on the benefits of zero emission bus projects and how to maximize those benefits by engaging with electric utilities like DEV.

Sincerely,

Lisa M. Guthrie

Lisa M. Guthrie
Executive Director
lguthrie@lmg-llc.net

PROJECT DESCRIPTION AND ASSURANCES DOCUMENT (PDAD)

Project title: Analytics and Control for Driving Capital Efficiency Project (ACDC)

Applicant Name: Virginia Electric and Power Company d/b/a Dominion Energy Virginia

Applicant Address: 120 Tredegar Street, Richmond, VA 23219

Names of all team member organizations (if applicable):

Virginia Electric and Power Company, d/b/a Dominion Energy Virginia (DEV or the Company), will be the primary organization executing the Analytics and Control for Driving Capital Efficiency (ACDC) project. Identified teaming partners include Mitsubishi Electric Power Products, Inc. (Mitsubishi), PingThings, LineVision, and GE Digital. Others may be added over time.

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

Amanda Prestage, 804.771.4416, amanda.k.prestage@dominionenergy.com

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

Heather Eades, 804.385.4122, heather.eades@dominionenergy.com

Include any statements regarding confidentiality.

Dominion Energy Virginia proposes in good faith that certain information designated herein be withheld from public disclosure on the grounds that it contains trade secrets, privileged, or confidential commercial or financial information and is disclosing the information only to the members of the DOE staff directly assigned to the matter as necessary in the discharge of their duties. DOE counsel and all members of the DOE staff, until otherwise ordered by a regulating body with the authority to do so, shall maintain the information in strict confidence and shall not disclose its contents to members of the public, or to other staff members not assigned to the matter.

Federal Share:	$33,654,095
Cost Share:	$33,654,095
Total Estimated Project Cost:	$67,308,190

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:

X_____electric grid operator

X_____electricity storage operator

X_____electricity generator
X_____transmission owner or operator

X_____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: n/a
Time Period for Resilience Investments: n/a

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

X_____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
X_____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: Amanda Prestage

General Manager – Corp. Strategic Planning

Address: 600 East Canal St., Richmond, VA 23219

Phone: 804.771.4416

E-mail: amanda.k.prestage@dominionenergy.com

Item 8: Signature of Authorized Organizational Representative (AOR)

Amanda K. Prestage

LineVision Inc.
529 Main Street, Suite 307
Boston, MA 02129 USA

The Honorable Jennifer Granholm

March 8, 2023

Secretary
U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585

Dear Secretary Granholm:

On behalf of LineVison, Inc. I am pleased to express our excitement to partner with Dominion Energy Virginia (DEV) on a GRIP Smart Grid application for Analytics and Control for Driving Capital Efficiency (ACDC) Project.

LineVision is a Boston, MA based Grid Enhancing Technology (GETs) company, which manufactures in the USA, and provides industry-leading solutions that monitor the condition and behavior of overhead high-voltage transmission lines. LineVision can significantly increase line capacity through Dynamic Line Ratings (DLR). LineVision's unique, non-contact sensors and sophisticated analytics also enable new actionable insights into the real-time status and long-term health of transmission lines while improving real-time situational awareness helping to ensure optimal, safe, and reliable operation.

Implementing DLR is a critical and necessary element to achieving the clean energy transition. The technology can unlock up to 40% more capacity on existing transmission lines, eliminating congestion and enabling the rapid interconnection of renewable energy resources. New transmission lines, while needed, cost millions of dollars per mile and take many years to construct. DLR can enable capacity expansions at less than 5% of the cost of new construction and can be delivered in a few months, not years.

DEV and LineVision have been partners working together since 2017 and have extensive experience with DLR. DEV has provided LineVision with valuable engineering advice and recommendations on best practices for DLR, resulting in product improvements, and ultimately has aided in LineVision's journey to becoming the most deployed DLR solution across America.

LineVision is committed to Diversity, Equity, and Inclusion (DEI) and has recruitment alliances with several educational institutions which serve under-represented communities in the Northeast. These include UMass Boston and UMass Lowell, Roxbury, BunkerHill and Minuteman Community Colleges, Olin College of Engineering.

LineVision works with electric utilities across the USA; all of our field sensor equipment has been installed by lineworkers from the International Brotherhood of Electrical Workers (IBEW). We support the IBEW and continue to provide on-site training on how our equipment functions and the best practices for installation.

DLR has the ability to remove congestion at critical points on DEV's system in Northern Virginia. The project will serve as a national example for shared learnings with other US utilities as they explore the need and use of DLR. LineVision is looking forward to, and is committed to, supporting and executing the scope of the ACDC project should DEV be awarded this grant.

Sincerely,

Hudson Gilmer
CEO
LineVision, Inc.

Hilary Pearson
VP of Policy
LineVision, Inc.

PingThings

March 12, 2023

U.S. Department of Energy
Grid Deployment Office
1000 Independence Avenue SW
Washington, DC 20585

Dear Madame Secretary Jennifer Granholm, DOE:

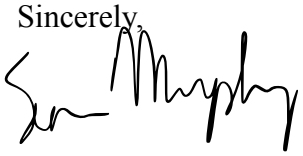
PingThings is pleased to partner with Dominion Energy Virginia (DEV) on the proposal titled "Analytics and Control for Driving Capital Efficiency (ACDC)" in response to DE-FOA-0002740 – GRIP [Topic Area 2].

PingThings' team is a world leader in integrating, storing, processing, building applications with, and applying machine learning to time series data from sensors at both scale and velocity. We offer the PredictiveGrid™, a time series application platform for utilities and other energy transition participants to rapidly deploy or develop use cases, new and old, driven by data from virtually any sensor that captures time-stamped measurements regardless of the number of sensors or their sample rates.

The platform's capabilities synergistically enable the development of applications critical to enabling a successful and cost effective energy transition, including the Dynamic Performance Monitoring work central to this proposal. We have been partnered with DEV since 2018 and our PredictiveGrid platform has been continuously ingesting and processing the utility's transmission data since 2019.

PingThings is a small but rapidly growing technology company that has had significant success with Department of Energy and ARPA-E projects. We look forward to collaborating with DEV and other partners and are committed to this exciting opportunity.

Sincerely,



Sean Murphy
CEO
PingThings, Inc.
1220 S Street, Suite 150
Sacramento, CA 95811-7147
sean@pingthings.io

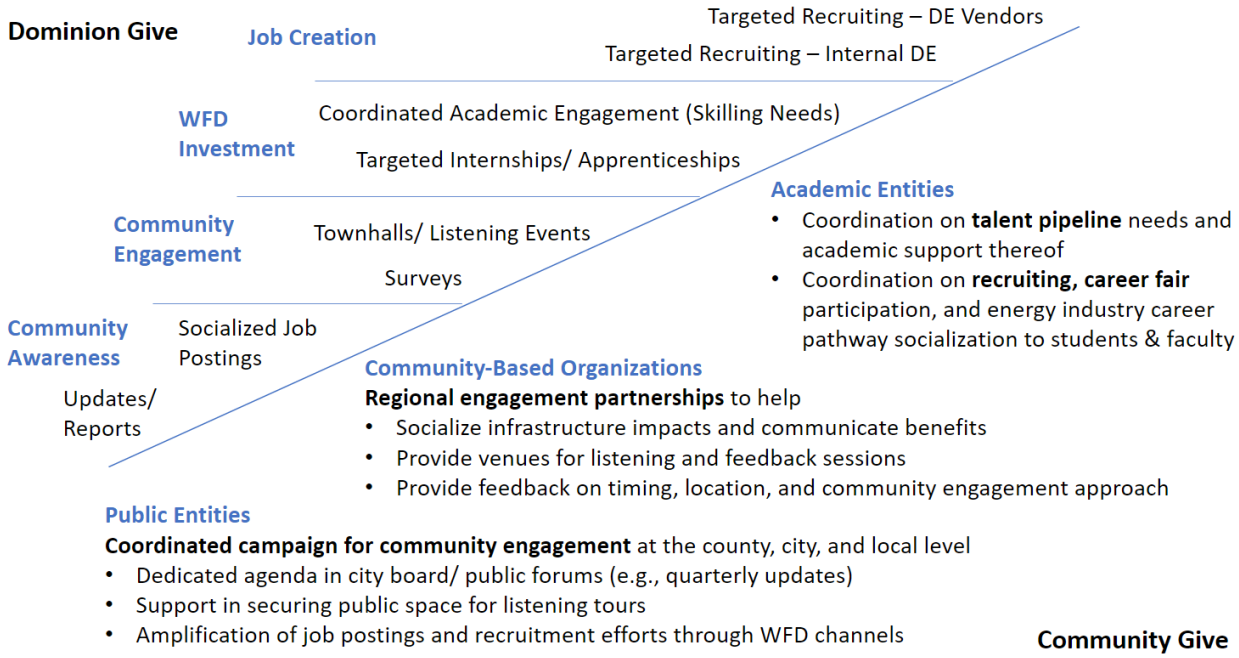
Community Benefits Plan Executive Summary

At Dominion Energy Virginia (DEV), we are dedicated to delivering safe, reliable, affordable, and sustainable energy, protecting the environment, and serving our customers and communities. We pride ourselves on aligning our formal plans and actions, including our investment strategy, to these core commitments.

We are reducing carbon emissions as we can as fast as we and technology allow. We have committed to Net Zero emissions across our electric operations by 2050. And we're ensuring we transition justly, equitably, and thoughtfully. The future can and should be decarbonized, reliable and affordable. For example, our commercial-scale Coastal Virginia Offshore Wind project is expected to avoid up to 5 million tons of carbon dioxide annually — and will have no fuel costs over the life of the project. Expanding our energy efficiency offerings helps customers reduce their bills and their carbon footprints. Making the grid smarter improves our ability to manage intermittent renewables while also improving reliability and enhancing resiliency. Our residential rates remain competitive nationally and regionally, despite major investments in the transition.

We anticipate that by accelerating ramps in essential renewables, managing rapidly increasing data center loads, and enabling more distributed energy resources on our grid, our ~$67M Analytics and Control for Driving Capital Efficiency (ACDC) project will help us maintain affordable rates while significantly improving reliability and transition outcomes.

To ensure the benefits of the ACDC project flow equitably across our communities, we have developed a detailed Community Benefits Plan (CBP) – outlined below.



Overview of our Engagement Plan and Partners

We have designed our ACDC CBP to ensure our customers and stakeholders have a meaningful voice in our planning and development processes. In cases where activities associated with the project will take place where historically disadvantaged or marginalized communities are present, we will directly and intentionally promote communication and engagement. We will ensure that concerns are appropriately addressed, and project impacts are mitigated to the greatest extent possible.

Dominion Energy, Inc. (DE), the parent company of DEV, has established an internal Grants Office to leverage the generational opportunity presented to us through IIJA and GRIP funding. Located within DE's Corporate Strategic Planning group, the Grants Office is responsible for the coordination, shaping and stewarding of our IIJA grant funding efforts across DE's shared services teams, including human resources, economic development, workforce development (WFD), public policy, and environmental services. This team has worked with our network of state and local affairs professionals, full-time environmental justice and tribal relations professionals, business units (BU), and project-specific external communications teams to develop our ACDC CBP. Collectively, we have taken care to leverage best practices, local knowledge, and lessons learned while also exploring additional outreach methods through this investment.

The Grants Office will continue to be involved in implementing all aspects of the ACDC CBP. DEV has dedicated approximately 2% of the ACDC budget to grant compliance, which includes working with the project-specific communications teams, compliance support, and technical experts to ensure the CBP is executed. Below, we detail our plans for engagement and instances where DEV envisions using this grant as an opportunity to advance and mature our informal WFD efforts.

We have already begun stakeholder outreach to socialize the value of the technologies and proposed smart grid investments across a variety of local government, grassroots, and academic organizations – which are identified below. The enthusiasm about ACDC has been apparent from our proposed partners, with discussions underway about how DEV can go further, faster—building a smarter, more secure and flexible grid to improve operational outcomes and prepare for the clean-energy transition.

Community Engagement

Building and maintaining meaningful, sustainable relationships with communities through proactive engagement and partnership is core to the way DEV does business. We seek to listen and understand a broad array of stakeholder perspectives to minimize potential impacts and maximize benefits to our communities. We engage individuals and communities through meaningful dialogue from the first days of planning through the final days of construction and beyond. From initial stakeholder identification to the "thank you" postcard sent when a project is completed, all aspects of engagement are carefully considered with stakeholders in mind.

Crafted from reflection and learnings from past project successes and challenges, DEV has established repeatable plans and processes to communicate projects with a focus on fostering active engagement from all stakeholders. We have formal processes in place for identifying and engaging environmental justice communities, Tribal governments, local municipalities, and local residents in the earliest stages of project development.

For ACDC, we anticipate minimum community disruption and limited material change in infrastructure aesthetics since work will take place within existing rights of way and substations. While we will analyze outreach needs across all technology plays in the project, we anticipate that our typical engagement practices will more than meet the need. In some limited cases, there may be temporary increased traffic in neighborhoods due to project work, and we will notify our neighbors accordingly. Postcards, letters, and individual meetings with landowners will be our primary engagement method. DEV has dedicated "Powerline" phone and email outreach channels directly staffed by the Electric Transmission team, which will be implementing many of these projects.

DEV's community-based organizations (CBO) outreach plan for ACDC includes a variety of local, regional, and statewide organizations. Although their missions differ, they are united by a shared commitment to serving their communities and maximizing the benefits of the ACDC investments. The chart below summarizes how we plan to engage our identified CBOs and our desired reciprocal actions from these partners (several of which have already expressed support for ACDC).

Specific Measurable Achievable Realistic and Timely (SMART) milestones highlighted

ACDC Communications Plan Process Guide	
Action	**Description**
SITUATIONAL ANALYSIS	
Consult with project manager	• Discuss available options and communication tools • Formulate preliminary **communications plan** to be presented at project kickoff
Evaluate potential impact of proposed project	• Consider scale, geography, history of area • Consult with local external affairs manager • Identify any preliminary community stakeholders (historical, cultural, HOAs, Civic Leagues) who may want to be involved (we have developed our initial list, below)
Visit site to see lay of land firsthand	• Visit project location(s) with project manager, siting and permitting specialist, and other internal team members as needed • Coordinate efforts to have photos taken of existing infrastructure if project calls to replace structures/equipment • Conduct **Environmental Justice Screen** and **historical resources desktop review** (we have done our initial screen and would go more deeply at this stage)
Create preliminary communications plan	• Share with project manager and team at project kickoff meeting • Garner feedback from broader internal team to make revisions
Determine communications budget	• Estimate cost based on level of communications support needed
PROJECT ANNOUNCEMENT OPTIONS	
Brief local, county and state officials	• Set up meetings through local external affairs manager; in-person meetings preferred • Ask parties to advise who else we should engage

ACDC Communications Plan Process Guide	
Action	**Description**
	• Work with project leads and permitting specialist to determine permitting needs and, where applicable, draft letters sent to county administrator and agencies
Notify cultural advocacy groups and agencies and Native American tribes	• Coordinate with tribal relations to provide project overview and solicit feedback on outreach • External affairs to conduct outreach as needed with affected parties • Draft and send appropriate **letters and/or postcards**; schedule follow-up meetings as needed
Inform affected property owners	• Determine if translation services are needed • Draft and send appropriate letters and/or postcards • Select parcel buffer area for **mailing list** based on review of parcel sizes, topography, and viewpoint distances • Schedule follow-up meetings as necessary with individual landowners and groups/HOAs/civic associations
Create ACDC webpage within DEV website	• Create ACDC webpage to include additional visual components to enhance project story, explain the ACDC technologies, and communicate benefits of the ACDC project • Update periodically as project updates are available
ACTIVE ENGAGEMENT TOOLBOX	
Public Input	• Listen to stakeholder values and concerns before developing proposed solutions • Consult with community leaders to develop best course of action if prudent. • Notify public via **letters, postcards, digital and social ads** based on project location and customer impact • Promote and request feedback sent to the Transmission Communication Team inbox
Additional individual or group meetings	• Meet with other interested parties as requested or needed • Consider community segments not currently engaged • **Give voice to silent groups and proactively inform community members** as needed
Email updates, proactive communications and social media posts	• Provide **mailed updates** throughout project as appropriate • Utilize **social and digital communications plan** depending on project scope • Work with External Affairs to proactively brief localities as needed or at milestones

In addition to the above, DEV will host an annual ACDC webinar for community stakeholders. The webinar will provide an overview of DEV's CBP commitments and ACDC project updates, highlighting progress and community benefits delivered. Our plan is to include a technical overview of ACDC's project aspects, helping the community learn more about innovative technology that is helping manage and scale clean energy. Our webinar will include a community partner spotlight to highlight meaningful contributions by our partners to support ACDC. The webinar will conclude with a Q&A session, and community members would be provided materials and resources to learn more, provide feedback, and reach out directly to DEV.

DEV has already and will continue to put great thought and effort into community engagement for ACDC. We have identified the following CBOs as key leaders and influencers whom we either have or will approach to request support across a variety of WFD, recruiting, communications, and feedback activities. The below table reflects conversations to date, where we have received enthusiastic support from desired partners.

ACDC Community Based Partners	Recruiting and WFD	Job Training	Outreach & Community Engagement
George Mason University	**X**		
Virginia Career Works Northern	**X**		
Virginia Asian Chamber of Commerce	**X**		**X**
Capital Youth Empowerment Program	**X**	**X**	**X**
Virginia Transit Association			
Northern Virginia Regional Commission	**X**		**X**
Virginia Clean Cities*			**X**
Northern Virginia Transportation Commission			

*Interested in having DEV speak on webinars and present materials at conferences on ACDC topic

DEV has had initial conversations about partnership with the following organizations.

Desired and Potential Community Based Partners	
• Metro Washington Council of Governments • Greater Washington Partnership • Northern Virginia Hispanic Chamber of Commerce • Virginia Poverty Law Center	• Northern Virginia Community College • Virginia Tech • University of Tennessee Knoxville

How will we measure the success of our Community Benefits Plan?

DEV will use the following milestones to measure the success of our proposed plan.

Milestones	Measures
MACRO 2024 SMART GOAL	• Identify key project stakeholders and meaningfully engage them in project development plans
Design and launch outreach campaign	• Stand up formal outreach team (one dedicated FTE) • Develop ACDC communications plan • Launch ACDC project website
Conduct formal EJ review	• Complete steps for EJ screening through remediation (see J40 section)
Begin public outreach	• Hold four CBO-hosted presentations/ input sessions
Develop & deploy socialization & feedback content	• Distribute postcard mailers to project neighbors with project information and feedback channels • Provide awareness flyers and talking point contact to all CBO partners for socialization (will tailor depending on targeted need)
Launch Annual ACDC Webinar	• Send out communication about the contents, time, and place of webinar two months prior to ensure widespread community awareness and engagement • Focused outreach to CBOs that represent DACs and minority populations to ensure engagement and feedback from these groups • Share ACDC CBP SMART goals prior to and during webinar
MACRO 2025-2027 SMART GOAL	• Maintain regular contact with project stakeholders and keep them updated on project status at important milestones
Continue public outreach & content development	• Continue above activities for content creation (mailers, updated website) • Craft and implement individual communication plans based on individual project scopes (GEV, DPM, DLR, GFI) and the communities they benefit
Annual ACDC Webinar	• Continue above activities • Communicate how DEV is tracking against CBP goals
MACRO 2027 SMART GOAL	• Create reflective report summarizing community engagement efforts and synthesizing feedback to refine future outreach efforts

Milestones	Measures
Issue final report	• Publish community engagement report following ACDC – indicating number of events, summarizing feedback, indicating key insights from community and how DEV incorporated into project planning and implementation

Investing in the American Workforce

DEV recognizes the critical role the American workforce has played and will continue to play in the energy transition. Our teams are on the front line, ensuring a strong, resilient grid while undertaking the monumental task of decarbonizing it. As such, we sought to understand the impact ACDC would have on our staff, working with planning, procurement, and delivery teams to assess needed capacity. We have concluded ACDC will require an additional 10-20 jobs which will be a mix of internal and external positions, specifically Transmission Operations Engineers and IT staff. These roles would be compensated at above-market rates – as has been our history and as is part of our commitment to retaining top talent and delivery partners. Moreover, we intend to make all the internal roles (eight) permanent positions after the project is complete.

While the total roles created by ACDC are relatively modest, the growth in clean energy jobs across Virginia at the utility-scale and distributed levels will be unprecedented in the next decade. Nearly 85,000 GWh of new clean energy– much of which will be complemented by storage – will need to be developed across DEV territory to meet the company's Net Zero commitment by 2050 and comply with applicable state-level energy policy. Meanwhile, just under half of DEV's workforce is eligible for retirement within the next decade – exactly when we need to be doubling down on power systems engineering professionals, data science, and applied intelligence skills—the core competencies needed to deliver a decentralized, decarbonized, and digitized grid. It is with these needs in mind, and the opportunity presented by GRIP's smart grid grant, that our Grants Office and WFD teams collaborated to develop our ACDC academic outreach plan.

Our award-winning academic engagement is already robust, spanning secondary and post-secondary institutions and WFD organizations. From DEI-focused internships, major investments in historically Black and Hispanic-association colleges and universities, to collaborating on cutting-edge research, we have a deep and proud history of working with educators and talent incubators. With ACDC, we plan to expand and deepen existing partnerships while more than doubling our formal roster of college and university partners (from 27 to 65), in concert with our newly expanded WFD team.

Through this grant application, we have formalized greater engagement between our business units and WFD team, identified current and future-state talent needs (for ACDC and beyond), and defined a new, more ambitious academic engagement plan. We have already begun mobilizing it, and feedback from our technical college and university partners has been swift and enthusiastic. Our full list of academic levers – which we are applying variously across current and new (targeted) partners include:

- Establish formal school / program contact and regularly conduct engagement activities (classroom visits, guest speaking, hosting site visits / tours, etc.)
- Increase recruitment activities over baseline (more prominent recruiting fair presence, career day discussions)
- Formalize and establish regular communication of job opportunities to campus career advisors, reflecting DEV's own needs and those of our partners
- Increase promotion of DEV internships
- Expand military, veteran, and military spouse-centered recruiting focus
- Increase focus on diversity, equity, and inclusion recruiting
- Identify opportunities for curriculum input, concentration / certificate programs (with a focus on power systems engineering)

DEV has already initiated conversations with several longstanding partners about deeper, more formal engagement including George Mason University's College of Engineering and Computing, Virginia Tech's Bradley Department of Electrical and Computer Engineering (ECE), and University of Tennessee Knoxville's Center for Ultra-Wide-Area Resilient Electric Energy Transmission Networks (CURENT) on what partnership might look like under ACDC.

Each of these partnerships brings something unique to ACDC: George Mason is the largest and most diverse academic institution in Virginia and has extensive experience developing talented, diverse pipelines for companies and industry (DEV has a representative on its advisory board and has a history of innovative collaboration at GMU). Virginia Tech boasts one of the largest electrical and computer engineering programs in the country with focuses on smart power systems and cybersecurity (DEV has several board leaders and champions at VT and we recruit deeply from this flagship school). CURENT is a graduated National Science Foundation (NSF) Engineering Research Center that was jointly supported by NSF and the DOE for 10 years before becoming self-sustaining. Bringing these partnerships together allows DEV to foster new talent, engage academia and public sectors, and generate excitement and optimism for the next wave of grid operators.

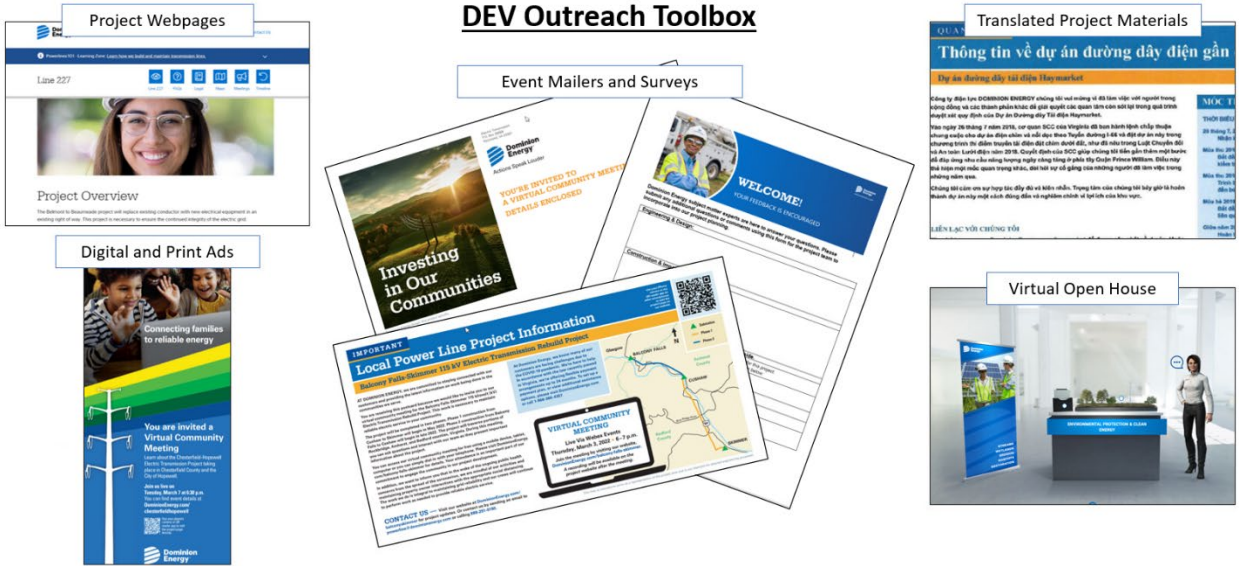
Our ACDC academic engagement strategy will also incorporate a deeper focus on military talent. We have been recognized as a top Military Friendly Company since 2010, with 20% of our new hires and 18% of our employees being military-connected. As with our existing university partnerships, we will seek to broaden and deepen where and how we invest in recruitment and creation of onramps for long-term skilling and placement. That means lowering the barrier to entry by exploring apprenticeships and programs that do not require a college degree to enter our workforce, as well as identifying transferable skills for mid-level and management positions.

We have a history of innovative program design for our military members, which we would continue for this initiative. We partnered with the Center for Energy Workforce Development to spearhead the piloting, development, and launch of the Troops to Energy Jobs program, a nationwide initiative that provides a pathway for veterans to transition from military service to

careers in the energy industry. As an active leader of Troops to Energy Jobs for over a decade, we will be exploring how we might leverage this program for expanded energy transition opportunities, such as those presented by ACDC.

Diversity, Equity, Inclusion, and Accessibility

Dominion Energy, Inc. (our parent company) has a strong history of diversity, equity, and inclusion (DE&I). In the early 2000s, it formed an executive diversity council and has continued to make DE&I a core value. Through both internal and external measures, we have walked the talk at Dominion Energy, Inc. Yearly DE&I training is a requirement for annual employee incentives – with continuously refreshed training required on sexual harassment, workplace discrimination, supplier diversity, unconscious-bias, and allyship. From a recruiting perspective, we are on track to exceed our diversity workforce goals (which span race, gender, cultural, and neurological facets) of 40% staff representation by 2026. Externally, for the last two years we have exceeded our $1 billion annual spending target with diverse suppliers as well.



With ACDC, our delivery partners have diverse supplier commitments – and have confirmed they would meet and/or exceed these if successfully awarded. They have also committed to ensuring a safe, healthy, and discrimination-free environment for their workforce, as have we. With respect to community outreach, our ACDC CBP will include a dedicated team with deep experience in equitable, accessible outreach. This team will identify disadvantaged communities across our project area and if applicable, create special programming for them to ensure their involvement in project planning and implementation. If translation services are determined to be needed, content will be made available in relevant languages.

The team will, at minimum, create the following tools and content (pictured above) to elicit community feedback (each of which has ample and successful engagement precedent):

- Communications Push
  - Dedicated ACDC project webpage
  - Existing virtual open house
  - Dedicated email and phone number and committed staff to support
- Communications Pull
  - ACDC print mailers and survey (with digital survey complement)
  - Dedicated DEV support for events and forums hosted by workforce partners

Our CBO partners listed above will be provided tailored messaging for their respective constituencies (e.g., data center alley county boards in Fairfax vs. Virginia Clean Cities whose mission is to scale electric vehicle adoption), and they would respectively support the creation of space and dedicated time for community dialogue and feedback.

Justice40 Initiative

At DEV, we are committed to giving a voice to all communities affected by our infrastructure projects and to guarding against any one group being disproportionally impacted. We also want all communities to benefit from the economic opportunities presented by clean-energy investments. To ensure this commitment is matched by action and process, we established a formal environmental justice (EJ) policy in 2018, have trained more than 1,000 employees on EJ to date, and review all major construction projects for EJ concerns.

A recent example of this policy in action involved DEV convening a grassroots community advisory board to ask for help identifying targeted outreach needs for the routing of a new transmission line. The board connected DEV to a local historian with expertise in African American history. Together, they walked potential routes to make sure sensitive sites were identified (they were, and planning was adjusted accordingly). In 2022, more than 60 projects were reviewed for EJ considerations, with similar community engagement occurring. We have already conducted an initial assessment for ACDC, as well.

For ACDC, project teams will incorporate a full EJ review at the onset of the project, just as they do when pulling data on environmental, historic, and cultural resources, as well as tribal interests. Analysis and outcomes will be discussed as a project team (including legal) to determine project effects, alternatives, and needed communications. The following is a high-level summary Dominion Energy's EJ process.

#	EJ Policy Process Steps
1.	Determine whether an EJ Community or other Sensitive Community exists within the proximity of the proposed project or a reasonable alternative
2.	If an EJ or Sensitive Community is identified, determine whether that community bears (or will bear) a disproportionate impact of the negative environmental and health-related effects of existing industrial, governmental, and commercial operations on programs and policies, and the proposed project (i.e., ACDC)
3.	Develop communications, outreach, or other actions designed to engage with the identified EJ or Sensitive Community in a manner that allows them to participate in the project development

#	EJ Policy Process Steps
	and/or permitting process meaningfully so that their views and input can be considered by DEV and, if relevant, regulatory decision makers
4.	Incorporate the EJ or Sensitive Community's views and input, as well as the raw data relating to the extent of the disproportionate impact (if any) into DEV's decision-making documents, and, if relevant, present that information and DEV's mitigation plans to regulatory decision makers
5.	Document DEV's compliance with the environmental justice policy (to the extent additional documentation after Step 4 is necessary)

ACDC has 4 distinct elements, which target accelerating the deployment of utility-scale renewables and clean distributed energy resources in an intelligent, flexible, planned manner. While infrastructure will be placed in specific locations, the benefits will be system-wide for all project elements except our Grid Edge Visibility (GEV) project. And even then, GEV is an investment toward system-wide intelligence. We have also mapped the overlay of each of the above investments to Disadvantaged Communities (DAC), as identified by the DOE Disadvantaged Communities Reporter tool[1]. The ACDC project scope includes work on existing transmission lines and substation infrastructure which will have minimal-to-no negative impacts on the surrounding areas. DEV does not foresee the daily lives of any project neighbors, including those living in DACs, to be negatively impacted by the ACDC work. Where possible, we deliberately placed sensors and hardware in locations determined to be beneficial to the respective DAC. The following table summarizes the mix of dollars and percent of total infrastructure located in the DOE-identified DACs.

Disadvantaged Community (DAC) | ACDC Play Crosswalk

PLAY	T/D	PROJECT LOCATIONS				COST	# of DACs in Play	% of Play Infra. in DACs	$ Spent in DAC
		NC	VA	TOTAL	UNIT	TOTAL			
Dynamic Line Rating (DLR)	T	0	60	60	Sensors & Software	$29M	2	20%	$4M
Grid Forming Inverter Pilot (GFI)	T	0	1	1	Devices	$5M	1	100%	$5M
Dynamic Performance Monitoring (DPM)	T	0	48	48	Sensors & Software	$22M	20	40%	$2.4M
Grid Edge Visibility (GEV)	D	14	74	88	Devices	$10M	30	27%	$2.5M

Some figures rounded for presentation purposes

Explanation of DAC Mapping

- **DLR**: DEV estimates DACs cover about 20% of the area where DLR sensors will be deployed (12 of 60 total sensors), comprising $4M of the $20M in total sensor/ hardware and data acquisition costs (other project costs are for software)
- **GFI**: The $5M GFI will initially be installed and tested in a DAC in Petersburg, VA.

[1] https://energyjustice.egs.anl.gov/

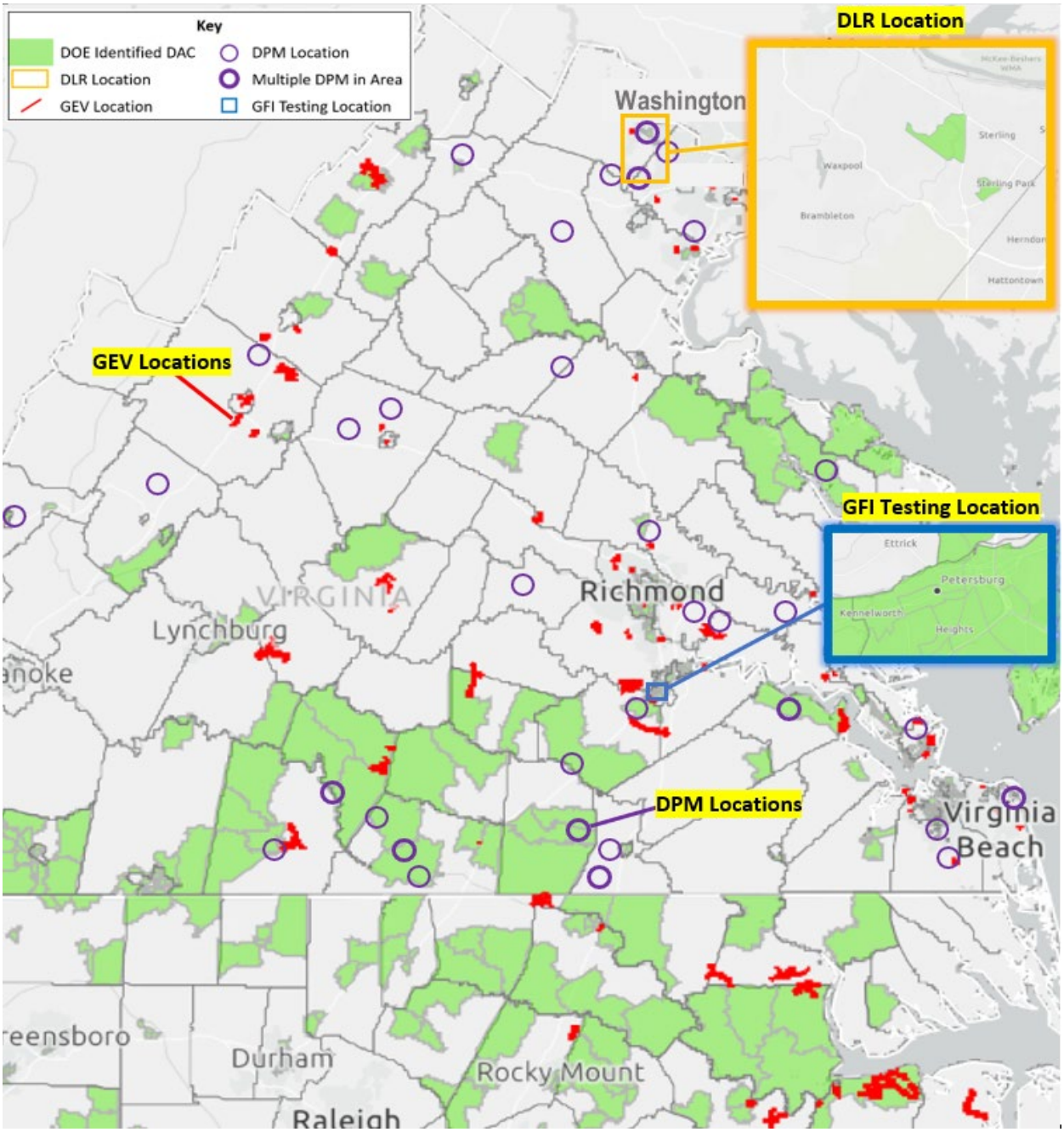
- **DPM**: 20 DPM sensors will be installed in a DAC. (Note: DPM software and platforms have system-wide benefits, in addition to specific locational benefits of sensors). The total cost of DPM is $22M, $5.4M of which can be tied to a location, and 40% of which is in a DAC ($2.4M)
- **GEV**: About 25 GEV devices (of 88 total) will be installed on feeders that serve 1 or more DACs across Virginia and Northeast North Carolina

The below table summarizes key benefits we anticipate ACDC delivering to DACs over the course of our project rollout as well as after the project is concluded.

Summary of DAC Benefits	How ACDC will maximize the benefit?	How will the benefit flow to DACs?
High-quality job creation, clean energy job pipeline, and job training	DEV is dedicated to working with academic institutions to increase the clean energy jobs pipeline and provide job training for individuals	DEV will work with academic institutions to increase diverse recruiting & talent pipelines – for internal recruiting and for our partners
Increased parity in clean energy technology access and adoption	ACDC technology will increase community access to clean energy. The execution of this project will increase the speed these technologies are adopted across the utilities industry	~40 unique DACs will have ACDC's clean energy technology infrastructure located within it
Increases in energy democracy, including community ownership	GEV will enable more community and individual-owned distributed energy resources such as EVs	~30 DACs will have 1 or more feeder with a GEV device benefiting it
Increase in energy resilience	DPM has the potential to reduce 500 outages per year	~20 DACs will have DPM sensors within the it, however, this benefit will be system wide
Decrease environmental exposure	DPM could avoid an average of tens of millions of dollars of clean energy curtailment annually from 2029-2037 reducing reliance on other energy sources	~20 DACs will have DPM sensors within the it, however, this benefit will be system wide

ACDC Project Locations with DOE-Mapped DACs

The map below illustrates the placement of hardware for the above plays across these locations in Virginia and North Carolina.



Dominion Energy Virginia | Analytics and Control for Driving Capital Efficiency Project

Virginia Electric and Power Company (Dominion Energy Virginia or DEV) has designed the Analytics and Control for Driving Capital Efficiency (ACDC) project to expand critical grid management capabilities needed for responsibly and effectively stewarding the energy transition. As clean and distributed energy resources (DER) are deployed, grid operators will need new tools for planning, managing, and controlling them to ensure we stay on track and achieve federal/state energy policy objectives, as well as our own Net Zero commitments. Through ACDC, we focus on three needs:

1. **Boosting Capacity.** Strategically boosting network capacity through targeted technologies that enable more structural reconductoring and line build out.
2. **Controlling Loads**. Increasing understanding and control of inverter-based resources like solar, wind, and storage through voltage and frequency fluctuation management.
3. **Improving Forecasting**. Materially improving our asset planning and resource management capabilities for where and how to prioritize grid upgrades to accommodate surging electrification and geographically diverse load growth.

ACDC would meet these needs through a pioneering set of transmission and distribution sensors, devices, and systems that would increase grid flexibility, unlock asset efficiencies, and mitigate localized or wide-spread outages that stem from uncoordinated DER growth. The project will:

- Deploy **the largest dynamic line ratings project in the world** to allow DEV's operators to more effectively manage 35 square miles of some of the most congested area in PJM (which has seen a 200 to 500% load increase on certain circuits in less than three years);
- Deploy **big-data performance monitoring of utility-scale renewables** with network-wide 1kHz sensors at key nodes, enabling targeted DER management to avoid curtailment of renewable generation due to grid stability concerns;
- Deploy **intelligent reclosers on the grid edge** to cover 100% of the remaining 3-phase 34.5kV distribution network, enabling deeper operator visibility and management of DER; and,
- Pilot the first-ever **grid forming inverter** (GFI) on a renewables microgrid and translate key learnings to develop the next generation of industry-wide GFI capabilities and designs to support renewables growth.

ACDC would accelerate DEV's grid management capabilities for the above efforts by a minimum of five years. The project's benefits can be tangibly measured in dollars, carbon emissions reductions, and reliability from increased renewable uptime (~$70M/year), as well as avoided congestion costs ($~300M/year)—a total annual average of ~$370 million of benefits in the years following the ACDC project completion in 2028.

Key Project Team Members: Dr. Matthew Gardner, Robbie Wright, Dr. Kevin Jones, Rick Siepka, Marlu Deverick, Dr. Micah Till, Robert Mason, Mark McVey, Aaron Tickle

Major Participants: DEV will be the primary organization executing the ACDC project. Identified teaming partners include Mitsubishi Electric Power Products, Inc., PingThings, LineVision, and GE Digital. Others may be added over time.

Concept Paper Identification Code: TA2-149-E

Analytics & Control for Driving Capital Efficiency (ACDC)

Project Overview:

With the Analytics and Control for Driving Capital Efficiency (ACDC) project, Dominion Energy Virginia would boost our distributed energy resource (DER) management capabilities with greater control than previously possible. Doing so will support our customers' expectations through more coordinated interconnection, leading to more strategic asset planning and deployment.

Project Goals:

Boosting Capacity. Increasing network capacity is necessary given the expected three to four times increase in electric loads, electric vehicle sales (50% by 2030),[1] data center growth, and two to three times renewables growth[2] in the next decade.

Controlling Loads. Controlling voltage and frequency fluctuations caused by inverter-based resources like solar, wind, and storage are essential to absorbing 40% renewable penetration in the generation mix.

Improving Forecasting. With $73B of decarbonization investments anticipated for Dominion Energy, Inc. through 2035, fidelity in asset planning and resource management will be paramount, informed by better intelligence about where and how to prioritize grid upgrades to meet surging electrification and geographically diverse load growth.

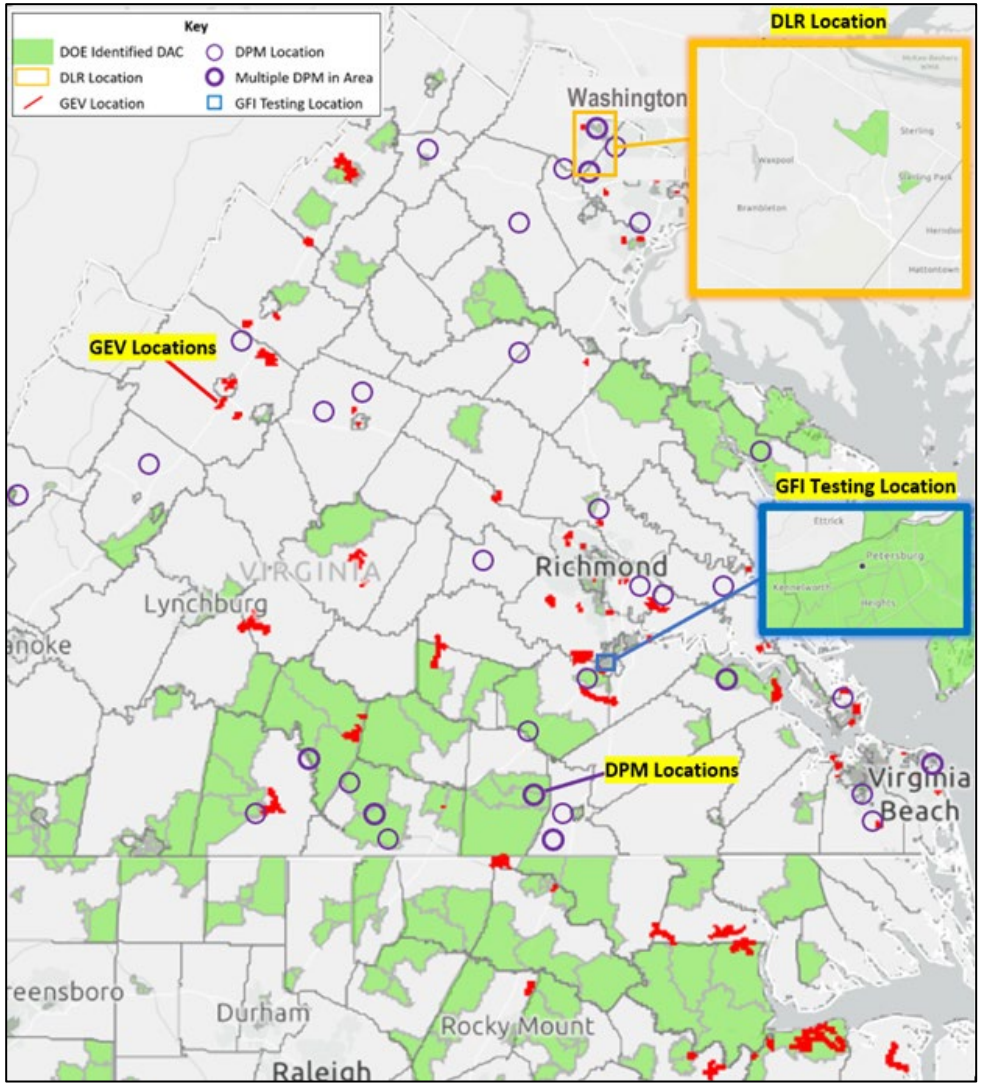
Project Managers:

- Dr. Matthew Gardner, Vice President, Transmission
- Rick Siepka, Manager, Electric Distribution Grid Planning
- Dr. Kevin Jones, Manager, Electric Transmission Operations
- Marlu Deverick, Manager, Electric Transmission Operations

Key Personnel:

- Aaron Tickle, Manager, Grid Resiliency
- Dr. Micah Till, Supervisor, System Protection
- Robert Mason, Consulting Engineer
- Mark McVey, Principal Engineer

ACDC Project Locations with DOE Mapped DACs[3]



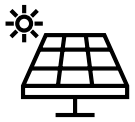
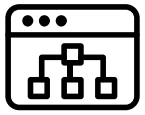
[1]FACT SHEET: President Biden Announces Steps to Drive American Leadership Forward on Clean Cars and Trucks

[2]NREL Study Identifies the Opportunities and Challenges of Achieving the U.S. Transformational Goal of 100% Clean Electricity by 2035

[3]Department of Energy (DOE); Disadvantaged Communities (DAC); Grid Edge Visibility (GEV); Grid Forming Inverter (GFI); Dynamic Performance Monitoring (DPM); Dynamic Line Rating (DLR)

Analytics & Control for Driving Capital Efficiency (ACDC)

Technology Summary

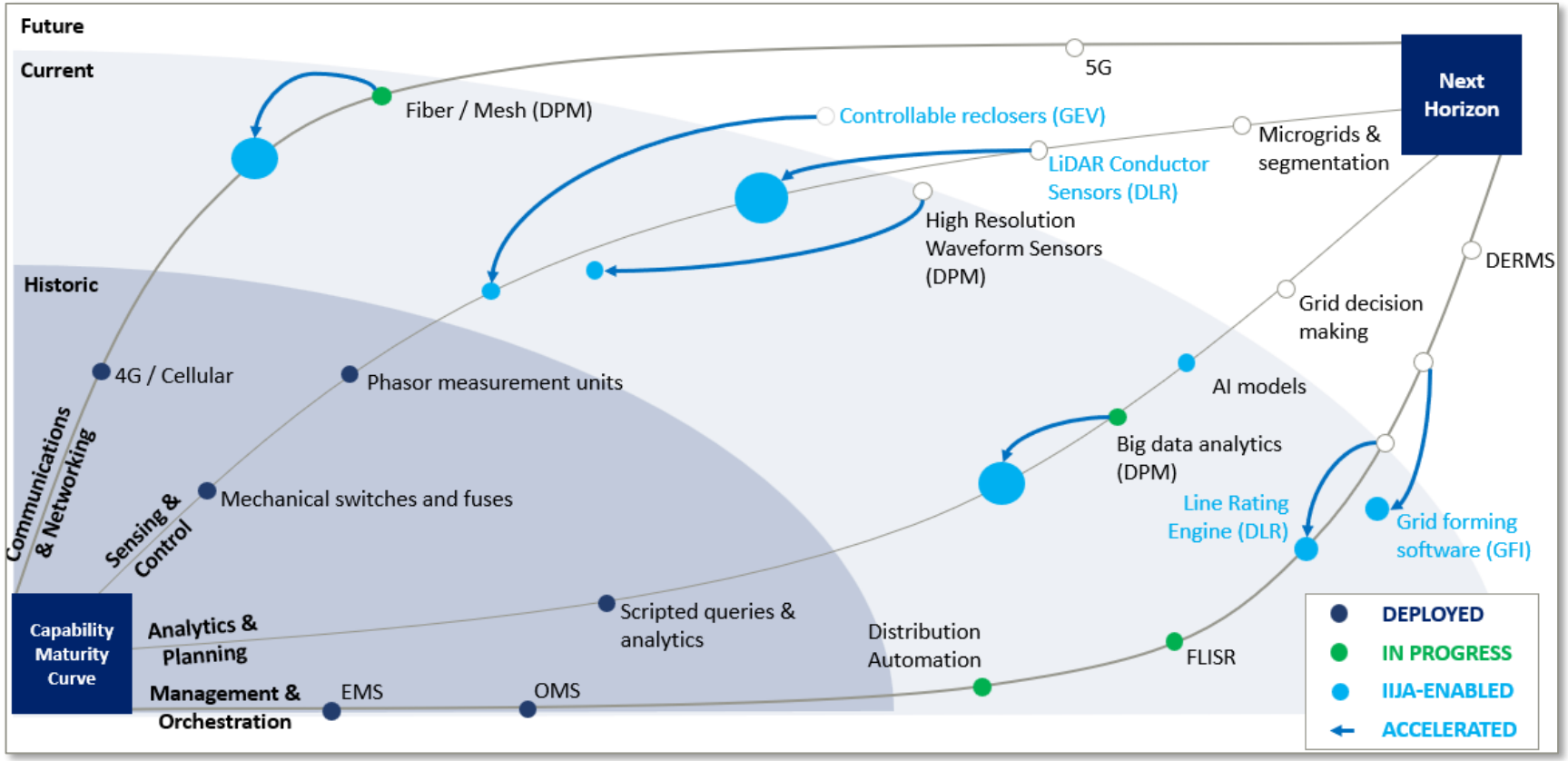
	Objective	Technology Summary	Technology's Impact
Transmission	Boosting capacity	 **Dynamic Line Rating (DLR)** system – Includes 1) deployment of sensors with spatial telemetry on key transmission lines across 35 square miles that service critical data center loads in Northern Virginia and 2) deployment of scalable prediction engine/control modules to allow transmission operators to identify additional existing capacity, mitigate short-term congestion, and gain operational flexibility. Potential to deliver 10 to 30% additional capacity in the largest known deployment of its kind to date, globally	• Mitigates potentially $300 million of congestion costs borne by Virginians • Improves short-term system flexibility for switching for industrial customers • Achieves operational expertise needed for territory-wide expansion to enable more renewable energy interconnections
	Controlling loads	 **Grid Forming Inverter (GFI)** – A pilot of grid forming inverter technology to develop capabilities and protocols for widespread adoption by Dominion Energy Virginia (DEV). Pilot would deploy first-of-its-kind GFI on an active renewable interconnection for rural micro-grid enablement	• First open-source grid forming software ever developed for utility-use • First installed 2 to 4MW renewable microgrid for islanded rural community • Insights for GFI DEV-wide rollout and PJM/FERC rulemaking process
	Improved forecasting	 **Dynamic Performance Monitoring (DPM)** – A cutting-edge effort to instrument DEV's transmission network with greater than 1kHz resolution and develop a predictive platform to understand the dynamic performance and stability of utility-scale renewables. Would optimize and inform future capital investment planning as renewables generation expands	• Achieves coverage of key transmission and generation assets with 1 kHz telemetry • Avoids forgoing up to $70 million in value from clean energy due to curtailment
Distribution		 **Grid Edge Visibility (GEV)** – Deploying devices and control capabilities to 100% of the remaining 3-phase 34.5 kV distribution network, enabling renewable integration at nearly 24,000 rural customer sites in Virginia and North Carolina while equipping operators with intelligent grid devices	• Improves grid planning with access to more DER data from GEV devices • Supports significant projected increase in DER penetration behind 88 devices • Provides 24k customers with direct visibility and restoration potential from investment

Dominion Energy®

Analytics & Control for Driving Capital Efficiency (ACDC)

Value Case and Project Costs

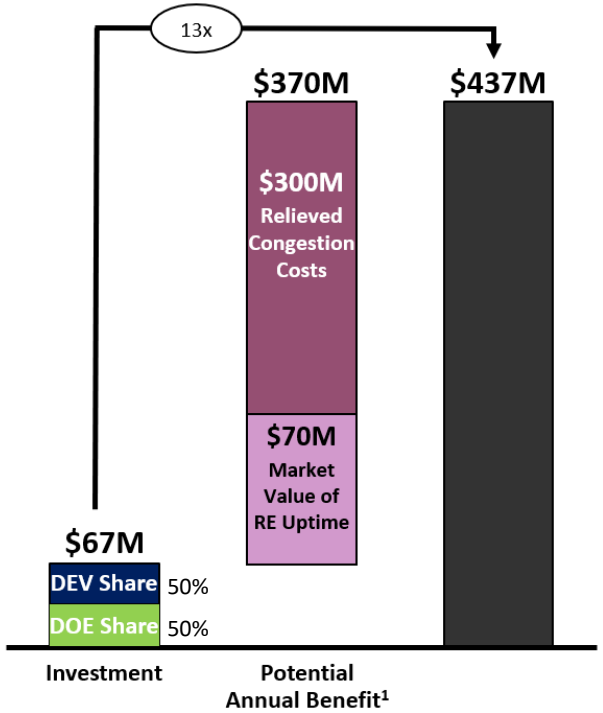
Technology development curves & how ACDC would accelerate & scale them



Grid operators are consistently looking to new technologies to manage the grid – the ACDC proposal would dramatically accelerate Dominion Energy Virginia's (DEV) capabilities by five to ten years, realizing the promise of the energy transition sooner for Virginians and North Carolinians.

Amplifying Federal Investments

Every federal dollar invested into ACDC will potentially result in $11 of societal benefits, averaged from 2029-2037.



[1]Potential Annual Benefit represents the average savings that DEV customers could experience **annually** as a result of increased visibility of the electric grid. This is based on 2022 data and assumptions.

Dominion Energy

STATEMENT OF PROJECT OBJECTIVES (SOPO)

Analytics and Control for Driving Capital Efficiency (ACDC)

A. OBJECTIVES

Increases in clean energy generation and electrification have accelerated the clean energy transition nationwide – and are on pace to scale exponentially. While distributed energy resources (DER) are fundamental to achieving net zero goals and enabling a cleaner grid for customers – they must be integrated intelligently and systematically. Through ACDC, Virginia Electric and Power Company (Dominion Energy Virginia, DEV, or the Company) is proposing to meet three critical needs to enable the energy transition:

1. **Boosting Capacity.** Increasing network capacity is necessary for the expected three to four times increase in electric loads, electric vehicle (EV) sales (50% by 2030)[1], data center growth, and two to three times renewables growth in the next decade[2]
2. **Controlling Loads**. Controlling voltage and frequency fluctuations caused by inverter-based resources (IBR) like solar, wind, and storage are essential to absorbing 40% renewable penetration in the generation mix
3. **Improving Forecasting**. With $73B of decarbonization investments anticipated for DE through 2035, fidelity in asset planning and resource management will be paramount, informed by better intelligence about where and how to prioritize grid upgrades to meet surging electrification and geographically diverse load growth

When combined, the proposed technologies will prepare DEV for the energy transition through digital prediction and control to mitigate the uncertainties that emerge with a cleaner, more resilient, and reliable energy future for our customers.

B. SCOPE OF WORK

To address the challenges of the clean energy transition, DEV is planning systematic investments to enable a digital grid. The Company will deploy advanced technologies, such as sensors, control systems, and automation, to monitor and control power flows on the grid:

- **Dynamic Line Rating (DLR)** system – Includes 1) deployment of sensors with spatial telemetry on key transmission lines across 35 square miles of critical data center loads in Northern Virginia; and 2) and deployment of scalable prediction engine/control modules to allow transmission operators to identify additional existing capacity, mitigate short-term congestion, and gain operational flexibility. This investment has the potential to deliver 10-30% additional capacity in the largest known deployment of its kind to date, globally.

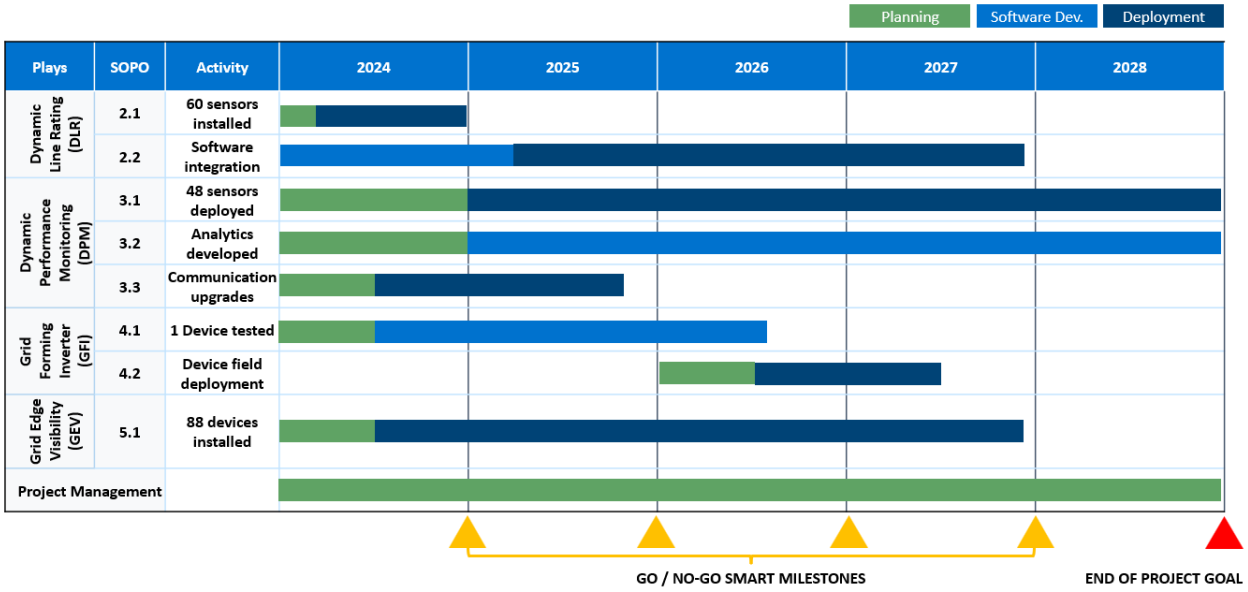
[1] The White House. "FACT SHEET: President Biden Announces Steps to Drive American Leadership Forward on Clean Cars and Trucks." https://www.whitehouse.gov/briefing-room/statements-releases/2021/08/05/fact-sheet-president-biden-announces-steps-to-drive-american-leadership-forward-on-clean-cars-and-trucks/.

[2] Office of EERE. "NREL Study Identifies the Opportunities and Challenges of Achieving the U.S. Transformational Goal of 100% Clean Electricity by 2035." Department of Energy.2022. https://www.energy.gov/eere/articles/nrel-study-identifies-opportunities-and-challenges-achieving-us-transformational-goal

- **Dynamic Performance Monitoring (DPM)** is a cutting-edge effort to instrument DEV's transmission network with >1kHz resolution and develop a predictive platform to understand the dynamic performance and stability of utility-scale renewables. DPM would optimize and inform future capital investment planning as renewable generation expands.
- **Grid Edge Visibility (GEV)** deploys devices and control capabilities to 100% of the remaining 3-phase 34.5 kV distribution network, enabling renewable integration at nearly 24,000 rural customer sites in Virginia and North Carolina while equipping operators with intelligent grid devices.
- **Grid Forming Inverter (GFI)** pilots a GFI technology to develop capabilities and protocols for widespread adoption by DEV. The GFI pilot would deploy a first-of-its-kind GFI on an active renewable interconnection for rural micro-grid enablement.

C. TASKS TO BE PERFORMED

The following section details the Recipient's workplan, major milestones, and proposed go/no-go decision points. This will be a 60-month project, launching after an anticipated Fall 2023 award through the winter of 2028. The Recipient proposes annual (12-month) Go/No-Go decision points that align to the calendar year.



<u>Task 1.0: Project Management and Planning</u>

Subtask 1.1 – 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 1.4: 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 – Dynamic Line Ratings

Subtask 2.1 – Sensor Deployment

DEV will deploy 60 sensors across our transmission network in Northern Virginia's Data Center Alley to measure physical parameters and behavior of conductors. We will work with vendors and engineering, procurement, and construction firms (EPCs) to deploy sensors on key transmission towers. This will include relevant communications technologies and the testing of sensors by vendors and DEV personnel.

Subtask 2.2 – Software Deployment

DEV will develop and implement a control and decision-making module in our energy management system to allow for real-time and future-casted decisions about conductor capacity. We will purchase and integrate relevant software modules to allow our system operators to interface with line rating data and manage the transmission network with higher capacity. This also includes the deployment of a predictive future-casting line rating engine.

Task 3.0 – Dynamic Performance Monitoring

Subtask 3.1 – Sensor deployment

DEV will deploy 48 new and upgraded sensors at critical substations across our transmission network to measure variation and instability. Our engineers will install firmware that enables additional measurements. We will contract with a vendor to measure an additional 3,000 sites to understand systemic variability and instability. These data will be consolidated in an expanded data lake.

Subtask 3.2 – Software development
To support decision making, DEV will refine research-grade software to fully enable predictive grid opportunities to deliver on the anticipated benefits. We will dedicate in-house resources as well as use contracted services to successfully complete this development activity.

Subtask 3.3 – Communications upgrades
With rapidly increasing data production, DEV will invest in upgraded substation and head end communications equipment to enable the DPM project. Our information technology group will make critical network upgrades at each site and invest in an expanded digital backbone that is necessary for this frequency of data as well as future-proof for additional investments.

Task 4.0 – Grid Forming Inverter
Subtask 4.1 – Test GFI in controlled environment
DEV will procure, install, and test parameters for a GFI to support the rise of IBR on the network, developing internal capabilities and protocols to accelerate clean generation adoption.

Subtask 4.2 – Deploy and test GFI
The GFI will then be deployed to the field on a utility-scale solar site that can provide island/microgrid capabilities to a rural community.

Task 5.0 – Grid Edge Visibility
Subtask 5.1 – Device Deployment
DEV will install 88 intelligent reclosers onto key 34.5kV distribution circuits that lack visibility and control capabilities. DEV engineering will identify and design sites. Field crews will be responsible for the installation, communication, and testing and commissioning of the devices.

Below is a table of proposed annual Go/No-Go Decision Points aligned with annual SMART milestones that will demonstrate progress in attaining the benefits of the Recipient's Scope of Work. As indicated, these align to the proposed Tasks and Sub Tasks.

SMART End-of-Year Milestones (2024-2027)			
2024	**2025**	**2026**	**2027**
2.1 – DLR sensor deployment complete on critically congested lines 3.2 DPM data acquisition successful from 3,000 distributed sensors	2.3 - All System Operation Center personnel trained on new energy management system (EMS) module 3.3 – All communication efforts completed	2.2 – Ten additional lines of DLR enabled	4.2 – Install GFI at utility-scale renewable site in DEV territory

SMART End-of-Project Goals (2028)			
Dynamic Line Ratings (DLR)	**Dynamic Performance Monitoring (DPM)**	**Grid Forming Inverter (GFI)**	**Grid Edge Visibility (GEV)**
Deploy system-wide EMS control module and sensors on most critically congested network to provide 10 to 30% increased capacity on average	Distribute 48 sensors and ingest data from 3,000 additional sites into data lake for real-time visibility and reduced IBR curtailment	Test and develop capabilities for GFI deployment on IBR and install GFI on renewable site to enable community microgrid	Install 88 smart reclosers to benefit more than 24,000 customers across service territory and allow for DER penetration on circuits

D. DELIVERABLES

Subtask 1.1: Project Management Plan

Subtask 1.3 – Cybersecurity Plan (*if applicable)

Subtask 1.4 – Pre-Continuation Briefing Document(s)

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 conference.

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: Virginia Electric and Power Company

UEI: SZ2DG8WLKRG3

* Street1: 120 Tredegar Street

Street2:

* City: Richmond County:

* State: VA: Virginia

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 23219-4306 * Project/ Performance Site Congressional District: VA-004

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: 26112 W Washington Street

Street2:

* City: Petersburg County:

* State: VA: Virginia

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 238032702 * Project/ Performance Site Congressional District: VA-004

Project/Performance Site Location 2

☐ 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: 304 NC Highway 11N

Street2:

* City: Ahoskie County:

* State: NC: North Carolina

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 27910-8825 * Project/ Performance Site Congressional District: NC-001

Project/Performance Site Location(s)

Project/Performance Site Location 3

☐ 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: 26118 Auburn Farm Road

Street2:

* City: Aldie County:

* State: VA: Virginia

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 20105-5880 * Project/ Performance Site Congressional District: VA-010

Project/Performance Site Location 4

☐ 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: (b) (4)] Eisenhower Avenue

Street2:

* City: Alexandria County:

* State: VA: Virginia

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 22304-1535 * Project/ Performance Site Congressional District: VA-008

Project/Performance Site Location 5

☐ 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: (b) (4)Sliding Hill Road

Street2:

* City: Ashland County:

* State: VA: Virginia

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 23005-7940 * Project/ Performance Site Congressional District: VA-001

Project/Performance Site Location(s)

Project/Performance Site Location 6

☐ 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: Old Garth Heights

Street2:

* City: Charlottesville County:

* State: VA: Virginia

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 22901-8911 * Project/ Performance Site Congressional District: VA-005

Project/Performance Site Location 7

☐ 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: Rubicon Crossing Road

Street2:

* City: Fredericksburg County:

* State: VA: Virginia

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 22407-4900 * Project/ Performance Site Congressional District: VA-007

Project/Performance Site Location 8

☐ 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: (b) (4) Columbia Avenue

Street2:

* City: Hampton County:

* State: VA: Virginia

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 23669-1765 * Project/ Performance Site Congressional District: VA-003

Project/Performance Site Location(s)

Project/Performance Site Location 9

☐ 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: 3072 centerville road

Street2:

* City: herndon County:

* State: VA: Virginia

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 20171-3715 * Project/ Performance Site Congressional District: VA-011

Project/Performance Site Location 10

☐ 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: Off North Mesa Drive

Street2:

* City: Hopewell County:

* State: VA: Virginia

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 23860-2413 * Project/ Performance Site Congressional District: VA-004

Project/Performance Site Location 11

☐ 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: 20 Commerce Road

Street2:

* City: Staunton County:

* State: VA: Virginia

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 24401-9022 * Project/ Performance Site Congressional District: VA-006

Project/Performance Site Location(s)

Project/Performance Site Location 12

☐ 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: Lynnehaven Road

Street2:

* City: Virginia Beach

County:

* State: VA: Virginia

Province:

* Country: USA: UNITED STATES

* ZIP / Postal Code: 23452-7318

* Project/ Performance Site Congressional District: VA-002

Additional Location(s)

Add Attachment | Delete Attachment | View Attachment

Kevin Jones, Ph.D.

Manager, Electric Transmission Operations - Electric Transmission Group

(b) (6)

kevin.d.jones@dominionenergy.com

EDUCATION

VIRGINIA POLYTECHNIC INSTITUTE & STATE UNIVERSITY

Ph.D., ELECTRICAL ENGINEERING 2011-2013

- dissertation: *Synchrophasor-Only Dynamic State Estimation & Data Conditioning*

M.S. ELECTRICAL ENGINEERING 2009-2011

- thesis: *Three Phase Linear State Estimation with Phasor Measurements*

B.S. ELECTRICAL ENGINEERING 2005-2009

EXPERIENCES **DOMINION ENERGY VIRGINIA**

MANAGER, ELECTRIC TRANSMISSION OPERATIONS ENGINEERING SUPPORT 2020-PRESENT

Currently lead an organization of 35+ senior engineers comprised of three distinct groups including Engineering Analytics & Modeling (see below), Special Studies which serves as an internal clearinghouse for new grid technology and focuses on physics-based modeling & simulation, and Fault Analysis which is a vertically integrated, data-driven team that uses sensor data and in-house, custom automation to provide operational intelligence to the Transmission Control room and field operations. Serves as the liaison between ET and IT for annual capital budget planning of up to $25M. Created collaborative partnerships with software companies & digital design firms to support digital transformation inside Electric Transmission. Developed an internal PMO with the comprised of third-party consultants.

SUPERVISOR, ELECTRIC TRANSMISSION ENGINEERING ANALYTICS & MODELING 2019-2020

First leader of the newly formed EA&M team focused on the use of time-series sensor data from the grid to generate business intelligence and create bespoke tools for Electric Transmission. Led a team of 7 senior engineers reporting to a Director. Managed Dominion Energy's PredictiveGridTM platform, OSISoft PI platform, synchrophasor data pipeline, custom robotic process automation capabilities, and oversight of third-party developers in support of a myriad of digital transformation projects.

CONSULTING ENGINEER, ELECTRIC TRANSMISSION OPERATIONS ENGINEERING 2017-2019

Continued to serve as the lead engineer & developer for the ANODE platform (see Special Projects section) Developed custom web tools for substation security management. Led the integration of PredictiveGridTM (see Special Projects section).

ENGINEER III, ELECTRIC TRANSMISSION OPERATIONS PLANNING 2014-2017

Lead engineer & developer for the creation, integration, and support of custom tools used by the reliability engineers to study and schedule planned outages including the ANODE platform. Lead engineer & developer for the DOE Project entitled "Open Source Extensible Control & Analytics Platform" (see *Special Projects* section). Co-led the Electric Transmission Solar Integration Task Force to address holistic impacts of solar integration. Supervised 1-5 graduate students each summer supporting projects such as the development of an ensemble day-ahead load forecast and an operator human-performance tool for grid voltage control.

ENGINEER III, ELECTRIC TRANSMISSION EMS ENGINEERING 2013-2014

Lead engineer & developer in support of the DOE Technology Demonstration project "Three Phase Linear State Estimator & Its Applications". Developed automated capabilities for PMU integration into openPDC. Open sourced the LSE. Reduced data error rates in Dominion's synchrophasor stream sent to PJM to less than 0.02%. Developed architectural roadmap for future synchrophasor data systems. Developed automated tools for weekly external EMS network model updates, for synchronizing transmission line models across disparate software tools, and for evaluating EMS state estimator performance for the NERC State Estimator Availability 10/30min metrics.

SPECIAL PROJECTS

ARPA-E 2018 Open Innovation
A National Infrastructure for Artificial Intelligence on the Grid (NI4AI)

- Co-PI of the NI4AI project with PingThings and UC Berkeley which aims to eliminate all barriers to entry for data science in T&D by deploying high-resolution sensors, collecting and open sourcing the data via the PredictiveGrid™ platform, and developing a robust community to support the creation of analytic use cases. https://ni4ai.org

PredictiveGrid™ Deployment at Dominion Energy

- Led the identification, technology & risk evaluation, and deployment of Dominion Energy's first cloud data platform, rejuvenating Dominion Energy's synchrophasor program and enabling creation of the Engineering Analytics & Modeling team.

The ANalysis On DEmand (ANODE) Platform

- Architected and developed the ANODE Platform for extensible, large scale, programmatic transmission outage planning analysis. ANODE increased the analytic throughput of Dominion Energy's Operations Planning team by over 1000X. Selected & worked with a third-party vendor team for commercialization. ANODE was the winner of the *2019 Dominion Energy Chairman's Excellence Peer Choice Award* and a finalist (1 of 4) up for the Edison Electric Institute's 2020 Edison Award:
- https://www.eei.org/News/news/All/eei-announces-finalists-for-2020-edison-award

PUBLICATIONS

- **Tracking Periodic Voltage Sags via Synchrophasor Data in a Geographically Bounded Service Territory** *Accepted to 2022 IEEE PES General Meeting* Xu, X., Mishra, C., Wang, C., Jones, K. D., & Vanfretti, L.
- **Experiences with Dynamical Mode Decomposition for Wide-Area Mode Estimation** *Accepted to MSCPES 2022 10th Workshop on Modeling and Simulation of Cyber-Physical Energy Systems* de Castro Fernandes, M., Mishra, C., Vanfretti, L., Xu, X., & Jones, K. D.
- **Identifying Oscillations Injected by Inverter-Based Solar Energy Sources** *Accepted to 2022 IEEE PES General Meeting* Wang, C., Mishra, C., Vanfretti, L., & Jones, K. D.
- **Using Spectral Flatness to Detect and Label Power System Oscillations in the Presence of Intermittent Broadband Noise** *Accepted to 2022 IEEE PES General Meeting* Segerstrom, E., Vanfretti, L., Mishra, C., Jones, K. D., & Gardner, R. M.

Marlu Deverick

Manager, Electric Transmission Operations - Power Transmission Group

804.305.9230

marlu.n.deverick@dominionenergy.com

EDUCATION

Virginia Commonwealth University, Richmond VA

- Master of Business Administration, 2013
- Bachelor of Science in Electrical Engineering, 2008

EXPERIENCES

Manager, Dominion Energy Virginia, 7/2022 to Present

Power Delivery - Operational Engineering & Reliability Support

- Ensures asset management activities for Transmission & Substation Equipment meet requirements for maximization of reliability. Responsible for Power Transformers, Distribution-level Substation Transformers, Breakers, Gas Insulted Substations, FACTS Devices, Instrument Transformers and Regulators
- Provides operational technical support during planned and emergent activities for the organization and critical customers.
- Oversees the DEV's Electric Transmission Emergency Preparedness program

Manager, Dominion Energy Virginia, 7/2019 to 6/2022

Power Delivery - System Operations Engineering

- Managed the operating and engineering support required by the System Operations Center. This engineering support role served as the design control authority for Energy Management System (EMS) software, hardware, and database applications
- Performed coordination of field activities affecting the bulk electric power system, and analysis of actual and planned operational events that affect reliability
- Developed the department's EMS modeling work management tool
- Led the successful upgrade of DEV's EMS system in 2022
- Led the design and development of a new Synchrophasor-based system for real time operations

Supervisor, Dominion Energy Virginia, 11/2016 to 6/2019

Power Delivery - Transmission System Protection Engineering

- Managed the development of protective relay settings for transmission protection schemes
- Worked with internal and external groups that support projects such as other engineering disciplines, design, drafting, construction, and project management
- Coordinated with Transmission Planning critical changes on the Facility Interconnection Requirements documentation
- Participated in the PJM Relay Subcommittee
- Maintained PRC-01, -23, -25 & -26 compliance requirements. Developed strategy for upcoming PRC-027 compliance requirements

System Protection Engineer, Dominion Energy Virginia, 10/2010 to 11/2016
Power Delivery – Transmission System Protection Engineering

- Performed engineering studies including relay setting calculations for substations and transmission lines
- Developed protection logic for special schemes
- Provided field support and commissioning support and maintained project documentation with respect to relay settings and calculations, design packages and as-built requirements
- Participated in the NATF Relay Settings Best Practices Working Group
- Led the development of the System Protection Training Program
- Identified PRC-023 latent compliance violation leading to a company self-report in 2012

EXPERTISE [TRAINING/CERTIFICATIONS]

- Professional Engineer registered in Virginia since 2014
- DEV's Engineering Enrichment Program coordinator since 2021. This program provides educational credit hours to professional engineers to maintain their certification
- Electric Power Research Institute's Manager of Technology Transfer for DEV since 2022
- IEEE Power & Energy Society member since 2010
- North America Transmission Forum System Protection & Operations practice groups member since 2010

OTHER

- Founded Dominion's Hola! Latino Employee Resource Group (ERG) in 2016 and served in leadership board
- Partnered and coordinated with the Randolph-Macon College and Dominion Energy employee resource groups, a learning and mentoring event for Latino women high school students interested in science (Pathway to Science program) since 2017

Augustus Johnson IV, PE

Director
Electric Distribution Grid Planning and Asset Management
804.727.9278
Augustus.Johnson@dominionenergy.com

EDUCATION

Virginia Commonwealth University, Masters of Business Administration
October 2012 – May 2014, Richmond, VA
University of Delaware, BS Electrical Engineering, Minor Japanese
August 1998 – May 2003, Newark, DE

EXPERIENCES

DOMINION ENERGY VIRGINIA **Richmond, VA**

DIRECTOR, GRID PLANNING & ASSET MANAGEMENT APRIL 2022 - PRESENT

- Leads organizations responsible for Capacity and Reliability planning, Vegetation Management, Equipment and Material Standards, Geospatial Information Systems, Asset Management and Preventative maintenance programs and systems.
- Acts as company witness in regulatory filings related to Grid Transformation and VA and NC Rate Cases.
- Notable projects and responsibilities include the deployment of an Enterprise Asset Management System and the development of strategic initiatives related to Integrated Distribution Planning, and the utilization of AI to target hazardous vegetation in distribution right of ways.

DIRECTOR, ELECTRIC DISTRIBUTION GRID SOLUTIONS OCTOBER 2020 - MARCH 2022

- Led organizations responsible for Advanced Metering Infrastructure (AMI), Distributed Energy Resources Management and Integration, Smart Cities, Business Development and Deployment of Fiber Optics as part of Dominion Energy's Rural Broadband Program, Project Management of Dominion Energy’s Grid Transformation Program.
- Acted as company witness for regulatory proceedings related to Grid Transformation, Rural Broadband, and Virginia Rate case proceedings.
- Notable projects include AMI deployment in Virginia and North Carolina, Electric School Bus Program, Distributed Energy Resources Management System (DERMS), Battery Energy Storage Pilot Program, FERC Order 2222 Task Team, and Port Electrification feasibility determination efforts at the Port of Virginia.

MANAGER, ELECTRIC DISTRIBUTION GRID PLANNING JULY 2019 - OCTOBER 2020

- Led teams responsible for Electric Distribution Data Center Planning, Electric Distribution Network Planning, Electric Distribution Protection and Coordination, Power Quality, Distributed Energy Resources Integration and Feasibility studies, Distributed Energy Resources Testing and Commissioning.

- Acted as witness coordinator for regulatory proceedings related to Grid Transformation and Battery Energy Storage Pilot Programs.
- Notable projects include Battery Energy Storage Pilot Programs, Electric School Bus Program.

MANAGER, ELECTRIC TRANSMISSION SYSTEM OPERATIONS ENGINEERING MAR 2014 - JUL 2019

- Led teams responsible for engineering support of Dominion Energy's Energy Management System (EMS) and Operator interface including SCADA integration, Alarm management, User tools and interface design, Power Flow analysis tools, and Operator Training Simulator.
- Directly responsible for managing vendor relationships and project initiation for both hardware and software deployments.
- Notable projects include several large EMS upgrades, specifications development and deployment of an 18' x 92' video wall used for monitoring and controlling the Electric Transmission system, and a joint project with EMS vendor for the specification and deployment of an Intelligent Alarm Processing system.

SUPERVISOR, ELECTRIC TRANSMISSION PROJECT CONTROLS OCT 2011 - MAR 2014

- Led project support team for all Electric Transmission Projects. Responsibilities included scheduling, budgeting, material acquisition, and administrative responsibilities related to Dominion Energy's Generation Interconnection Queue, Delivery Point Agreements, and Transmission Interface Agreements.

ELECTRIC TRANSMISSION AND SUBSTATION PROJECT MANAGER MAY 2009 - OCT 2011

- Responsible for the project management and oversight and Electric Transmission and Substation projects.
- Notable projects include Dominion Energy Virginia Synchrophasor Deployment and administrative duties related to the associated Department of Energy Smart Grid Grant.

EXPERTISE

- Licensed Professional Engineer, Commonwealth of Virginia

AWARDS AND PUBLICATIONS

- Co-Author
    - Y. Wang et al., "Value Stacking of a Customer-Sited BESS for Distribution Grid Support: A Utility Case," in IEEE Transactions on Power Systems, doi: 10.1109/TPWRS.2023.3242295.
    - Y. Wang, R. Liu, X. Li and A. Johnson, "Sizing and Scheduling of the BESS as an NWA Solution to the Distribution System," 2021 IEEE Power & Energy Society General Meeting (PESGM), Washington, DC, USA, 2021, pp. 1-5, doi: 10.1109/PESGM46819.2021.9637885.

Michael “Mike” Lamb

General Manager – Operations and Maintenance - Electric Transmission Group

804.814.4271

mike.lamb@dominionenergy.com

EDUCATION

Virginia Military Institute, BS Degree Electrical Engineering, 1984-1988

- Power Engineering focus

EXPERIENCES

General Manager – ET Operations & Maintenance, Dominion Energy, 2023-current

- Responsible for the safe and reliable operation of Dominion Energy’s Electric Transmission and Substation systems
- Oversee all Electric Transmission reliability programs and emergency response coordination (e.g., storm response)
- Manage vendor relationships for key components of ET business and owns all electrical equipment, system protection, and transmission lines standards for Dominion Energy
- Manages relationships and involvement with key industry and research partners including universities, Department of Energy, national labs, EPRI, CIGRE, NATF, etc.

Director – ET Operations Engineering & Reliability, Dominion Energy, 2019-2023

- Responsible for the operation and reliability of Dominion Energy’s transmission assets, including substations and transmission lines in three states
- Managed an organization that provides technical support and engineering resources for electrical equipment and operations, reliability functions, and provides technical support for Dominion Generation facilities

Manager – ET Operational Engineering Support, Dominion Energy, 2015-2019

- led a team of specialized engineers responsible for major electric transmission equipment specifications, system analysis, technical investigations, and root cause analyses, using state of the art tools, and providing analysis and guidance for emerging technological challenges
- coordinated EPRI involvement and funding for Power Delivery and Power Generation business units

Principal Engineer, Dominion Energy, 2000-2015

- Responsible for the technical oversight of the power transformer and shunt reactor procurement process in support of all Dominion Energy’s business units
- Managed and coordinated Dominion’s power station and transmission transformer replacement program
- Maintained strategic relationships with key manufacturers to ensure production slots and quality processes for power transformers

- Led diagnostic autopsies of failed power transformers with the repair vendors, evaluate redesigns, and oversee rebuilds

EXPERTISE

- Active member of CIGRE since 2007
- Currently CIGRE US National Committee (USNC) Regular Member of Study Committee A2 Transformers

AWARDS AND PUBLICATIONS

- Recipient of CIGRE USNC's Attwood Associate Award in 2018
- CIGRE Distinguished Member in 2020

Robert Mason

CONSULTING ENGINEER – ELECTRIC TRANSMISSION GROUP

804.762.3006

Robert.m.mason@dominionenergy.com

EDUCATION

[Virginia Tech, BS, EE, 2009]

- Bachelor of Science in Electrical Engineering, minor in Leadership Studies

EXPERIENCE

[Consulting Engineer, Dominion Energy, April 2022 - Present]

- Respond to emergencies across the Dominion Energy Electric Transmission system including engineering work, ordering materials needed, and providing needed support to the line crews.
- Select and manage multiple programs to perform routine transmission line equipment repair and replacement. Use data and field input to prioritize facilities based on criticality and urgency.
- Assess and pilot new technologies and methods to improve the safety, reliability, and capacities of in-service overhead transmission lines.

[Supervisor, Transmission Line Engineering Standards, Dominion Energy, May 2019 – March 2022]

- Lead a multidisciplinary team involved in all areas of transmission lines engineering and materials, as well as teams for underground transmission line engineering and antenna co-locations projects.
- Ensure projects are properly scheduled and communicated to team and the management, and work with all parties to ensure budgets and schedules align.
- Active in root cause investigations for material failures, compliance concerns, and needed changes to safety codes.

[Engineer III, Dominion Energy, December 2017 – April 2019]

- Evaluate material suppliers for a variety of product categories to identify suppliers to meet the needs of Electric Transmission Engineering and Construction.
- Engineer new hardware designs to meet future needs and work with suppliers to create standard assemblies for current and future projects.
- Active involvement with multiple working groups to improve interdepartmental communication, increase worker safety through implementing new standard design principles, and ensure compliance with regulatory demands.

[Engineer/Scientist III, Electric Power Research Institute, April 2015 – November 2019]

- Supervise and work alongside laboratory technicians with electrical testing of COTS and custom electrical power protection and distribution equipment; including UPS, PDUs, rectifier systems, and surge protection. Manage the scope, time and budgets for multiple simultaneous government projects.
- Design, budget, and implement improvements to laboratory infrastructure to improve efficiency and throughput of equipment testing programs. Identify current capability bottlenecks and create prioritized solutions which meet current needs and allow future expansion.
- Instructor and curriculum developer for several courses related to electrical power principles and installations. Classes teach the fundamentals of electrical installations and safe working practices (with an emphasis on lockout/tag-out and verifying de-energized equipment) and proper strategies for selecting and designing electrical protection systems.

[Lead Research Engineer, Schweitzer Engineering Labs, June 2009 – February 2015]

- Responsible for managing the Defense Services Power Systems Group, and coordinating with other Defense Services groups to support government customers for an international leader in power system protection, control, and automation
- Responsible for individual and group efforts to analyze data and perform detailed engineering analysis on electric power systems, automation systems, and facility infrastructure systems (fire, security, HVAC, water, etc.)

Mark McVey

Principal Engineer - Electric Transmission Group

804.257.4637

mark.mcvey@dominionenergy.com

EDUCATION

Virginia Tech Blacksburg, VA 1978-1982

- Bachelor of Science in Electrical Engineering
- Dual Majors in Power Systems and Control Theory

PROFESSIONAL EXPERIENCE

Principal Engineer Dominion Energy 2011-2023

Operations Engineering

- Technical Support All Business Units Power Delivery and Gas Delivery
- Subject Mater Expert Flexible AC Transmission Devices
    - Designer, Commissioning Engineer for 3- 500 KV Static VAR Compensators
    - Designer, Commissioning Engineer for 9 STATCOM installations
    - Designer, Commissioning Engineer World First Mobile 230/115 KV STATCOM
    - Designer, Commissioning Engineer 4-500 KV Series capacitor banks
    - Designer, Commissioning Engineer 2 distribution and 3- 115 KV Mobile Cap Banks
    - Designer, Project Manager and Commissioning Engineer 2-115 KV Mobile GIS
    - Designer, Project Manager and Commissioning Engineer 230 KV Mobile GIS

Consulting Engineer-Substations Dominion Energy 1997-2011

PJM Protection and Control Committee

- North American Syncro Phasor Initiative Development and Installation Committee
- Technical Standards Coordinator Dominion Transmission and Substation

EXPERTISE

- IEEE Senior Member 2013; IEEE Transmission and Distribution Subcommittee Member 2003-2011
- IEEE Capacitor Subcommittee Chair 2003-2011
- IEEE Substations 2008-2016; Member Contributor and Capacitor Subcommittee Liaison
- IEEE 1534 Recommended Practice for Specifying Thyristor Controlled Series Capacitors
- IEEE Surge Protective Device 2008-2018
- CIGRE B3 Substations & A3 High Voltage Equipment
- B3 AA3 Advisor all Air Insulated Substation brochures and activities 2019 to current
- IEC USNC Appointed Chair and Advisor TC 33 All Power Capacitor and Their Applications 2018

AWARDS

The CIGRE Distinguished Member Award B3 2022 Paris. The CIGRE Technical Council Award B3 2018 Paris. U.S. National Committee of CIGRE Attwood Associates Award 2018. Southeastern Electrical Exchange (SEE) Substation Award DOMINION ENERGY Cartersville Mobile GIS Substation Installation 2018. Southeastern Electrical Exchange (SEE) Chairman's Award DOMINION ENERGY STATCOM Project a Distributed Solution 2019. Southeastern Electrical Exchange (SEE) Chairman's Award DOMINION ENERGY Project Worlds First Mobile STATCOM 2020. Appointed Expert Emiratis IEC TC 33 2019.

PUBLICATIONS

- *Offshore Wind Integration Considerations*, TechCon 2023.
- *A Study of Synchronous Breaker Switching with Pre-insertion Resistor for Capacitors Banks*, IEEE Transactions 2017.
- *Mobile STATCOM, Multi Tool for Transmission Operations, Construction and Rapid Restoration* IEEE T&D 2018.
- *Severity of Partial Discharges in a Robust High Voltage Components* IEEE SGM Conference Paper 2020. *Capacitor Bank Model Validation with Particle Swarm Optimization Algorithm IEEE SGM* Conference Paper 2017.
- *Case Study of a New Type of Ferro resonance in Solar Power Plants IEEE* SGM Conference Paper 2019.
- CIGRE-IEC 2019 Conference on EHV and UHV (AC & DC) MMC-STATCOM application at Dominion Energy Colington Substation.
- *Case Study of a New Type of Ferro Resonance in Solar Power Plants* IEEE SGM Conference Paper 2017.
- *Load Rejection Overvoltage of Utility-Scale Distributed Solar Generation* IEEE SGM Conference Paper 2019.
- *Mitigating Geomagnetic Disturbances: A summary of Dominion Virginia power's efforts* IEEE Electrification 2015.
- *Capacitor measurement in the substation environment: a new approach* IEEE ESMO Conference Paper 2000.
- Author T&D Magazine December 2004 "Build the Ark Before the Flood".
- Co-Author T&D Magazine 2019 "Inrush Currents during Energization of Distributed Energy Resources Require Mitigation to Meet Interconnect Standards".
- Author T&D Magazine June 2020 "Dominion Energy Develops Mobile STATCOM".
- Co-Author T&D Magazine August 2020 "Mitigating to Meet Interconnect Standards".
- Co Author McGraw Edison *Standard Handbook for Electrical Engineers* Section 10.5 POWER CAPACITORS.
- Co Author *CIGRE Substations Green Book* 2019.

Richard C. “Rick” Siepka

Manager, Electric Distribution Grid Planning - Power Delivery Group

804.771.3702

rick.siepka@dominionenergy.com

EDUCATION

Lehigh University, Bachelor of Science Electrical Engineering, 1986

EXPERIENCES

Manager, Electric Distribution Grid Planning, Dominion Energy Virginia, 2016 - Present

Responsible for technical and engineering aspects of Dominion Energy’s electric distribution grid planning and reliability programs and advanced grid planning capabilities implementation.

Manager, Electric Transmission Services, Dominion Energy Virginia, 2015-2016

Led the organization responsible for siting, permitting, scheduling, and cost controls for electric transmission capital projects driven by NERC compliance requirements.

Manager, Electric Distribution Operations, Dominion Energy Virginia, 2010-2015

Led the field operations organization in the Richmond, Virginia Metropolitan area responsible for day-to-day operations and maintenance of the distribution grid.

EXPERTISE

Six Sigma Black Belt

PROFESSIONAL ASSOCIATIONS

Electric Power Research Institute (EPRI) Distribution Operations and Planning research program advisor

COMMUNITY INVOLVEMENT

Member of the Area 31 (North of the James) Special Olympics of Virginia council.

Aaron M. Tickle

Manager Grid Resiliency - Power Delivery Group

804.335.8581

aaron.tickle@dominionenergy.com

EDUCATION

Averett University, Danville, VA
Masters of Business Administration, December 2006

Virginia Polytechnic Institute and State University, Blacksburg, VA
Bachelor of Science, Electrical Engineering, May 2001

EXPERIENCE

Manager Grid Resiliency, (Grid Resiliency) May 2022

- Manage a team of engineers and technical professionals responsible for implementing multiple Grid Transformation Programs including Main Feeder Hardening and Voltage Island Mitigation
- Assist in guiding various projects through the process of scoping, execution, and reporting

Supervisor (Distribution Coordination & Protection) 2020 – 2022

- Oversaw a team of engineers responsible for sizing and programming various types of distribution protection equipment
- Provide technical and operational guidance to engineer team members and other departments on various subjects such as Arc Flash, FLISR, & switching practices
- Develop workforce plans to address team needs, workload, and changing technologies

Electric T&D Project Manager II (Strategic Underground) 2014 – 2020

- Managed overhead to underground conversation projects through phases of scoping, right-of-way acquisition, design, construction, and as- built reporting
- Successfully managed professional service and construction contractors in a manner that ensured projects were completed on time and budgets were not exceeded
- Developed annual work plans and provided monthly status updates to leadership

Supervisor (Regional Operations Center) 2010 – 2014

- Developed and conducted training for new switching supervisors and refresher training for switch operators
- Review large scale project scopes and determine contingency restoration options during construction process
- Coordinated emergency response during outage situations

Engineer (Distribution Planning) (Distribution Reliability) 2001-2010

- Developed peak summer and winter transformer contingency plans
- Monitored load growth and new block load projects
- Successfully handled performance issues
- Supported System Reliability with data research and analysis

EXPERTISE

- Six Sigma Black Belt
- EIT Certified

OTHER [I.E., COMMUNITY INVOLVEMENT]

- Habitat for Humanity – Ashland – performed foundation work and prepped for inspection
- Rebuilding Together – Church Hill – replaced flooring, handrails, and performed general upkeep
- Elk Hill Spring Garden Group Home – performed landscape maintenance and general upkeep
- Shalom Farms – built an outdoor classroom area for use by elementary school children
- Goochland and Henrico County Middle Schools – careers in energy guest speaker
- Served in various coaching roles for Goochland recreation baseball, basketball, and soccer leagues
- Salem Baptist Church Missions Committee

Micah Till, Ph.D.

SUPERVISOR SUBSTATION ENGINEERING – ELECTRIC TRANSMISSION GROUP

804.219.8924

micah.j.till@dominionenergy.com

EDUCATION

The University of Tennessee — Knoxville, TN

- Doctor of Philosophy in Electrical Engineering — May 2017
- Concentration: Power Systems — GPA: 4.0/4.0
- Dissertation: *A Wide-area Analysis of Shifts in Electric Power System Generation Profiles and High-impact Event Scenarios*

The University of Tennessee — Knoxville, TN

- Master of Science in Electrical Engineering — May 2015
  GPA: 4.0/4.0

Tennessee Technological University — Cookeville, TN

- Bachelor of Science in Electrical Engineering — Dec. 2011
- Emphasis: Power — GPA: 4.0/4.0
- Honors: Suma Cum Laude, In Cursu Honorum, W.A. Howard Award

EXPERIENCE

14 years of engineering industry experience including work with Tennessee Valley Authority, ABB Schweiz AG, the University of Tennessee, and Dominion Energy.

Dominion Energy Virginia — **2013**–***present***

Supervisor, System Protection Automation & Analysis — Feb. 2022–*present*

- Led team of 7–11 technical staff for fault analysis, sensor deployment, and data processing
- Oversaw improvements to in-house diagnostic tools allowing faster restoration of service after automatic outages on the electric grid
- Facilitate multiple NERC compliance activities through data integration efforts

Supervisor, Special Studies — Jul. 2019–Jan. 2022

- Led team of 6–12 technical staff in providing domain expertise and engineering root cause analysis for novel operational challenges including solar PV modeling, FACTS performance analysis, BESS deployment, microgrid design, blackstart response, and EMP mitigation
- Coordinated Dominion communication with over two dozen industry groups, academic institutions, and research organizations

Engineer III, Electric Transmission Reliability — Jul. 2018–Jun. 2019

- Calculated reliability metrics used (e.g., SAIDI) for operations and planning
- Led team of engineers and technicians in developing data reporting tools

Engineer III, System Protection Engineering — Jun. 2017–Jun. 2018

- Designed protective relay settings

- Subject matter expert for NERC PRC-026
- Developed automated tools for line impedance and relay setting calculation

Contractor, Electric Transmission SOC May–Aug. 2016

- Supported PV modeling and dynamic data modeling for reliability studies

Contractor, Electric Transmission Planning May–Aug. 2015

- Modeled PV generation and dynamic loads for system planning studies

Contractor, Dominion Technical Solutions May–Aug. 2014

- Created ETAP model of Dominion's EHV system to measure effects of geomagnetic storms on GIC transformer harmonics

Contractor, Dominion Technical Solutions May–Aug. 2013

- Constructed RTDS model of Dominion's EHV system with virtual C37.118 PMU streams to simulate actual field deployment across entire footprint

AWARDS AND HONORS

Mitigation Team Lead, NERC EMP Working Group Apr. 2021–*present*

PUBLICATIONS

Total of 11 journal articles and 21 conference publications. A key selection is provided here:

- R. Orndorff, G. Alvarez, G. Ilunga, **M. J. Till**, K. D. Vance, "Segment static wires and fault location," *25th annual Georgia Tech Fault & Disturbance Analysis Conference*, Atlanta, GA, May 1-2, 2023, Accepted.
- T. Lin, K. Zafar, **M. J. Till**, "Analysis of unexpected line distance protection caused by islanded hydro generation unit," *25th annual Georgia Tech Fault & Disturbance Analysis Conference*, Atlanta, GA, May 1-2, 2023, Accepted.
- A. Ademola, X. Li, A. Pinceti, **M. J. Till**, K. Jones, R. M. Gardner, "Effects-based monitoring of geomagnetically-induced current using a convolutional neural network," *IEEE Trans on Power Delivery*, vol. 38, no. 1, pp. 85-94, Feb. 2023.
- B. Guddanti, G. B. Alvarez, N. Bilimoria, X. Li, **M. J. Till**, "Intelligent distribution bus automatic transfer scheme using IEC 61850," *2022 IEEE Industry Applications Society Annual Meeting (IAS)*, Detroit, MI, USA, Oct. 9-14, 2022, pp. 1-6.
- B. Wang, G. Alvarez, **M. J. Till**, Kevin Jones, Matthew Gardner, Rolando Burgos, Bo Wen, "Fault analysis and relay assessment on a substation system with high penetration of PV generation," *2022 IEEE 49th Photovoltaics Specialists Conference (PVSC)*, Philadelphia, PA, USA, Jun. 5-10, 2022, pp. 0693-0700.
- W. Yao, Y. Liu, D. Zhou, Z. Pan, **M. J. Till**, J. Zhao, L. Zhu, L. Zhan, Q. Tang, and Y. Liu, "Impact of GPS signal loss and its mitigation in power system synchronized measurement devices," *IEEE Trans. on Smart Grid*, vol. 9, no. 2, pp. 1141-1149, Mar. 2018.
- **M. J. Till**, Y. Liu, Y. Liu, M. Patel, and T. King, "Frequency response of the Eastern Interconnection due to increased wind generation," *IEEE PESGM 2014,* Washington D.C., vol. 1, no. 5, pp. 27-31, Jul. 2014.

Instructions and Summary

Award Number: TA2-149-E
Award Recipient: Virginia Electric and Power Company

Date of Submission: 15-Mar-23
Form submitted by: Virginia Electric and Power Company
(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!

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 five budget periods, consult your DOE 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			Total Costs	Cost Share %	Proposed Budget Period Dates
Budget Period 1	$12,596,000	$12,596,000			$25,192,000	50.00%	1/1/2024 - 12/31/2024
Budget Period 2	$9,893,300	$9,893,300			$19,786,600	50.00%	1/1/2025 - 12/31/2025
Budget Period 3	$5,705,550	$5,705,550			$11,411,100	50.00%	1/1/2026 - 12/31/2026
Budget Period 4	$3,763,245	$3,763,245			$7,526,490	50.00%	1/1/2027 - 12/31/2027
Budget Period 5	$1,696,000	$1,696,000			$3,392,000	50.00%	1/1/2028 - 12/31/2028
Total	$33,654,095	$33,654,095			$67,308,190	50.00%	

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	$4,143,000	$3,867,600	$3,330,300	$2,996,000	$1,397,000	$15,733,900	23.38%	
b. Fringe Benefits	$0	$0	$0	$0	$0	$0	0.00%	
c. Travel	$0	$0	$0	$0	$0	$0	0.00%	
d. Equipment	$5,064,000	$3,893,000	$5,117,000	$1,827,000	$575,000	$16,476,000	24.48%	
e. Supplies	$15,000	$0	$0	$0	$0	$15,000	0.02%	
f. Contractual								
Sub-recipient	$0	$0	$0	$0	$0	$0	0.00%	
Vendor	$15,650,000	$11,020,000	$1,920,000	$1,620,000	$1,170,000	$31,380,000	46.62%	
FFRDC	$0	$0	$0	$0	$0	$0	0.00%	
Total Contractual	$15,650,000	$11,020,000	$1,920,000	$1,620,000	$1,170,000	$31,380,000	46.62%	
g. Construction	$0	$756,000	$793,800	$833,490	$0	$2,383,290	3.54%	
h. Other Direct Costs	$320,000	$250,000	$250,000	$250,000	$250,000	$1,320,000	1.96%	
Total Direct Costs	$25,192,000	$19,786,600	$11,411,100	$7,526,490	$3,392,000	$67,308,190	100.00%	
i. Indirect Charges	$0	$0	$0	$0	$0	$0	0.00%	
Total Costs	$25,192,000	$19,786,600	$11,411,100	$7,526,490	$3,392,000	$67,308,190	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 (Hrs)	Pay Rate ([$/Hr)	Total Budget Period 1	Time (Hrs)	Pay Rate ([$/Hr)	Total Budget Period 2	Time (Hrs)	Pay Rate ([$/Hr)	Total Budget Period 3	Time (Hrs)	Pay Rate ([$/Hr)	Total Budget Period 4	Time (Hrs)	Pay Rate ([$/Hr)	Total Budget Period 5			
5.1	Distribution Designers (2)	4000			4000			2000					0			0	10000	616000	Internal Position Pay Grade
5.1	Electric T&D Project Manager II	1000			2000			2000			2000					0	7000	613000	Internal Position Pay Grade
3.x	Consulting Engineer (2)	4000			4000			4000			4000			3000			19000	1913000	Internal Position Pay Grade
3.3	IT Personnel (8)	18000			18000			18000			18000			10000			82000	7204000	Internal Position Pay Grade
3.1	Relay Technician (2)	4000			2000			2000			2000			2000			12000	760000	Internal Position Pay Grade
4.1/4.2	Principal Engineer	500			500			500			500					0	2000	223000	Internal Position Pay Grade
4.1	Consulting Engineer	1000			200			500			200					0	1900	185900	Internal Position Pay Grade
4.1/4.2	Engineer II	1000			200			500			200					0	1900	130900	Internal Position Pay Grade
4.1	Engineer III	500			2000			2000			500					0	5000	435000	Internal Position Pay Grade
4.1	Engineer III	500			2000			2000			500					0	5000	435000	Internal Position Pay Grade
4.1/4.2	Electric T&D Project Manager II	200			200			200			200					0	800	69600	Internal Position Pay Grade
4.1/4.2	Scheduler	200					0			0	200					0	400	28000	Internal Position Pay Grade
2.x	Consulting Engineer	1500			500			200			200					0	2400	232500	Internal Position Pay Grade
2.2	IT Project Manager	1500			1500					0			0			0	3000	253500	Internal Position Pay Grade
2.1	Consulting Engineer	2000			1500			2000			2000					0	7500	747000	Internal Position Pay Grade
2.2	Engineer III	1500			1500			2000			2000					0	7000	611500	Internal Position Pay Grade
2.2	IT Architect	2000			2000					0			0			0	4000	338000	Internal Position Pay Grade
2.2	Sr. Business System Analyst	2000			2000					0			0			0	4000	220000	Internal Position Pay Grade
2.2	System Operators (40)	4000					0			0			0			0	4000	332000	Internal Position Pay Grade
2.2	ET System Operation Consultant	2000			2000					0			0			0	4000	386000	Internal Position Pay Grade
	Total Personnel Costs	**51400**		**4143000**	**46100**		**3867600**	**37900**		**3330300**	**32500**		**2996000**	**15000**		**1397000**	**182900**	**15733900**	

Additional Explanation (as needed): Personnel salary rate per hour is a bundled rate; it is inclusive of base salary, annual incentive plan (AIP) and employee benefits (medical, dental, life insurance and all other). Budget periods 2-5 include inflation estimates for labor costs.

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	
			$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 http://www1.eere.energy.gov/financing/resources.html, 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. 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.

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**									
										$0	
	International Travel										
										$0	
	Budget Period 1 Total									**$0**	
	Domestic Travel	**Budget Period 2**									
										$0	
	International Travel										
										$0	
	Budget Period 2 Total									**$0**	
	Domestic Travel	**Budget Period 3**									
										$0	
	International Travel										
										$0	
	Budget Period 3 Total									**$0**	
	Domestic Travel	**Budget Period 4**									
										$0	
	International Travel										
										$0	
	Budget Period 4 Total									**$0**	
	Domestic Travel	**Budget Period 5**									
										$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. 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						
3.1	Digital Fault Recorder	(b) (4)			Past purchases	
3.3	Network Communication Equipment				Past purchases	
3.3	1G - 10G Upgrade Kits				Internal estimate	
3.3	MPLS Equipment				Internal estimate	
4.1	Typhoon Testing System				Vendor estimate	
4.1	Grid Forming Inverter				Vendor estimate	
4.1	Battery Energy Storage System				Vendor estimate	
2.1	LineVision Sensors				Vendor estimate	
	Budget Period 1 Total			$5,064,000		
Budget Period 2						
5.1	Intelligent grid device and associated equipment	(b) (4)			Past purchases	
4.1	Typhoon Testing System				Vendor estimate	
3.1	Digital Fault Recorder				Past purchases	
3.3	Network Communication Equipment				Past purchases	
3.3	1G - 10G Upgrade Kits				Internal estimate	
3.3	MPLS Equipment				Internal estimate	
	Budget Period 2 Total			$3,893,000		
Budget Period 3						
5.1	Intelligent grid device and associated equipment	(b) (4)			Past purchases	
4.1	Grid Forming Inverter				Vendor estimate	
4.1	Battery Energy Storage System				Vendor estimate	
3.1	Digital Fault Recorder				Past purchases	
3.3	Network Communication Equipment				Past purchases	
3.3	1G - 10G Upgrade Kits				Internal estimate	
3.3	MPLS Equipment				Internal estimate	
	Budget Period 3 Total			$5,117,000		
Budget Period 4						
5.1	Intelligent grid device and associated equipment	(b) (4)			Past purchases	
3.1	Digital Fault Recorder				Past purchases	
3.3	Network Communication Equipment				Past purchases	
3.3	1G - 10G Upgrade Kits				Internal estimate	
	Budget Period 4 Total			$1,827,000		
Budget Period 5						
3.1	Digital Fault Recorder	(b) (4)			Past purchases	
3.3	Network Communication Equipment				Past purchases	
3.3	1G - 10G Upgrade Kits				Internal estimate	
	Budget Period 5 Total			$575,000		
	PROJECT TOTAL			**$16,476,000**		

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. 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 Task #	General Category of Supplies	Qty	Unit Cost	Total Cost	Basis of Cost	Justification of need
Budget Period 1						
2.1	Hanging equipment	60	$250.00	$15,000	Internal estimate	
	Budget Period 1 Total			**$15,000**		
Budget Period 2						
				$0		
	Budget Period 2 Total			$0		
Budget Period 3						
				$0		
	Budget Period 3 Total			$0		
Budget Period 4						
				$0		
	Budget Period 4 Total			$0		
Budget Period 5						
				$0		
	Budget Period 5 Total			$0		
	PROJECT TOTAL			**$15,000**		

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) $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.

SOPO Task #	Sub-Recipient 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
		Sub-total	$0	$0	$0	$0	$0	$0

SOPO Task #	Vendor Name/Organization	Purpose and Basis of Cost	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	Project Total
3.1	PingThings	Data as a Service						
3.2	PingThings	Platform Upgrades (required to injest, store and access data)						
3.2	PingThings	Software Development						
3.3	PingThings	Firmware Development						
2.2	General Electric	Energy Management System Module						
2.2	TBD	EMS Configuration & Training						
2.1	TBD	Sensor Installation						
2.2	LineVision	LineRate - Ratings Development						
2.2	LineVision	LineHealth - Digital Twin						
2.2	LineVision	LineAware - Situational Awareness						
2.1	LineVision	Hardware Services						
4.1	TBD	BESS and GFI installation services						
4.1	MEPPI	Consulting & testing services						
3.1	TBD	DFR Installation						
		Sub-total	$15,650,000	$11,020,000	$1,920,000	$1,620,000	$1,170,000	$31,380,000

(b) (4)

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
		Sub-total	$0	$0	$0	$0	$0	$0

	Total Contractual		$15,650,000	$11,020,000	$1,920,000	$1,620,000	$1,170,000	$31,380,000

Additional Explanation (as needed): Permits may be required for SOPO Task 2.1 - contingency for access

Contains Business Sensitive, Trade Secrets, Proprietary, or Otherwise Confidential Information Exempt from Public Disclosure

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 Task #	General Description	Cost	Basis of Cost	Justification of need
Budget Period 1				
	Budget Period 1 Total	$0		
Budget Period 2				
5.1	Distribution Construction Resources	$756,000	Historical labor for similar work	Needed to install intelligent grid device
	Budget Period 2 Total	$756,000		
Budget Period 3				
5.1	Distribution Construction Resources	$793,800	Historical labor for similar work	Needed to install intelligent grid device
	Budget Period 3 Total	$793,800		
Budget Period 4				
5.1	Distribution Construction Resources	$833,490	Historical labor for similar work	Needed to install intelligent grid device
	Budget Period 4 Total	$833,490		
Budget Period 5				
	Budget Period 5 Total	$0		
	PROJECT TOTAL	**$2,383,290**		

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	
1	Grant administration	$320,000	Estimate of total cost percentage	
	Budget Period 1 Total	$320,000		
			Budget Period 2	
1	Grant administration	$250,000	Estimate of total cost percentage	
	Budget Period 2 Total	$250,000		
			Budget Period 3	
1	Grant administration	$250,000	Estimate of total cost percentage	
	Budget Period 3 Total	$250,000		
			Budget Period 4	
1	Grant administration	$250,000	Estimate of total cost percentage	
	Budget Period 4 Total	$250,000		
			Budget Period 5	
1	Grant administration	$250,000	Estimate of total cost percentage	
	Budget Period 5 Total	$250,000		
	PROJECT TOTAL	**$1,320,000**		

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. 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%		
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						**$0**	
G&A Costs						**$0**	
FCCM Costs, if applicable						**$0**	
OTHER Indirect Costs						**$0**	
Total indirect costs requested:	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	

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.

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
Dominion Energy	Cash		$12,596,000	$9,893,300	$5,705,550	$3,763,245	$1,696,000	**$33,654,095**
								$0
								$0
								$0
								$0
								$0
								$0
								$0
								$0
								$0
		Totals	$12,596,000	$9,893,300	$5,705,550	$3,763,245	$1,696,000	$33,654,095

Total Project Cost: $67,308,190 **Cost Share Percent of Award: 50.0%**

Additional Explanation (as needed):

Applicant Name: Virginia Electric and Power Company Award Number: TA2-149-E

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. DE-FOA-0002740	81.254			$12,596,000	$12,596,000	$25,192,000
2.						$0
3.						$0
4.						$0
5. Totals		$0	$0	$12,596,000	$12,596,000	$25,192,000

Section B - Budget Categories

6. Object Class Categories	Grant Program, Function or Activity				Total (5)
	DE-FOA-0002740				
a. Personnel	$15,733,900				$15,733,900
b. Fringe Benefits	$0				$0
c. Travel	$0				$0
d. Equipment	$16,476,000				$16,476,000
e. Supplies	$15,000				$15,000
f. Contractual	$31,380,000				$31,380,000
g. Construction	$2,383,290				$2,383,290
h. Other	$1,320,000				$1,320,000
i. Total Direct Charges (sum of 6a-6h)	$67,308,190				$67,308,190
j. Indirect Charges					$0
k. **Totals** (sum of 6i-6j)	$67,308,190				$67,308,190
7. Program Income					$0

Previous Edition Usable

SF-424A (Rev. 4-92)
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Section C - Non-Federal Resources

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) **Totals**
8. DE-FOA-0002740	$33,654,095	$0	$0	$33,654,095
9.				$0
10.				$0
11.				$0
12. **Total** (sum of lines 8 - 11)	$33,654,095	$0	$0	$33,654,095

Section D - Forecasted Cash Needs

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th quarter
13. Federal	$12,596,000	$3,149,000	$3,149,000	$3,149,000	$3,149,000
14. Non-Federal	$12,596,000	$3,149,000	$3,149,000	$3,149,000	$3,149,000
15. **Total** (sum of lines 13 and 14)	$25,192,000	$6,298,000	$6,298,000	$6,298,000	$6,298,000

Section E - Budget Estimates of Federal Funds Needed for Balance of the Project

	Future Funding Periods (Years)			
(a) Grant Program	Budget period 1	Budget period 2	Budget period 3	Budget period 4-5
16. DE-FOA-0002740	$19,786,600	$11,411,100	$7,526,490	$3,392,000
17.				
18.				
19.				
20. **Total** (sum of lines 16-19)	$19,786,600	$11,411,100	$7,526,490	$3,392,000

Section F - Other Budget Information

21. Direct Charges	22. Indirect Charges

23. Remarks

Instructions for the SF-424A

General Instructions
This form is designed so that application can be made for funds from one or more grant programs. In preparing the budget, adhere to any existing Federal grantor agency guidelines which prescribe how and whether budgeted amounts should be separately shown for different functions or activities within the program. For some programs, grantor agencies may require budgets to be separately shown by function or activity. For other programs, grantor agencies may require a breakdown by function or activity. Sections A, B, C, and D should include budget estimates for the whole project except when applying for assistance which requires Federal authorization in annual or other funding period increments. In the later case, Sections A, B, C, and D should provide the budget for the first budget period (usually a year) and Section E should present the need for Federal assistance in the subsequent budget periods. All applications should contain a breakdown by the object class categories shown in Lines a-k of Section B.

Section A. Budget Summary Lines 1-4 Columns (a) and (b)
For applications pertaining to a **single** Federal grant program (Federal Domestic Assistance Catalog number) and **not requiring** a functional or activity breakdown, enter on Line 1 under Column (a) the catalog program title and the catalog number in Column (b).

For applications pertaining to a **single** program **requiring** budget amounts by multiple functions or activities, enter the name of each activity or function on each line in Column (a), and enter the catalog number in Column (b). For applications pertaining to multiple programs where none of the programs require a breakdown by function or activity, enter the catalog program title on each line in **Column** (a) and the respective catalog number on each line in Column (b).
For applications pertaining to **multiple** programs where one or more programs **require** a breakdown by function or activity, prepare a separate sheet for each program requiring the breakdown. Additional sheets should be used when one form does not provide adequate space for all breakdown of data required. However, when more than one sheet is used, the first page should provide the summary totals by programs.

Lines 1-4, Columns (c) through (g)

For new applications, leave Columns (c) and (d) blank. For each line entry in Columns (a) and (b), enter in Columns (e), (f), and (g) the appropriate amounts of funds needed to support the project for the first funding period (usually a year).

For continuing grant program applications, submit these forms before the end of each funding period as required by the grantor agency. Enter in Columns (c) and (d) the estimated amounts of funds which will remain unobligated at the end of the grant funding period only if the Federal grantor agency instructions provide for this. Otherwise, leave these columns blank. Enter in columns (e) and (f) the amounts of funds needed for the upcoming period. The amount(s) in Column (g) should be the sum of amounts in Columns (e) and (f).

For supplemental grants and changes to existing grants, do not use Columns (c) and (d). Enter in Column (e) the amount of the increase or decrease of Federal funds and enter in Column (f) the amount of the increase or decrease of non-Federal funds. In Column (g) enter the new total budgeted amount (Federal and non-Federal) which includes the total previous authorized budgeted amounts plus or minus, as appropriate, the amounts shown in Columns (e) and (f). The amount(s) in Column (g) should not equal the sum of amounts in Columns (e) and (f).

Line 5—Show the totals for all columns used.

Section B. Budget Categories
In the column headings (a) through (4), enter the titles of the same programs, functions, and activities shown on Lines 1-4, Column (a), Section A. When additional sheets are prepared for Section A, provide similar column headings on each sheet. For each program, function or activity, fill in the total requirements for funds (both Federal and non-Federal) by object class categories.

Lines 6a-i—Show the totals of Lines 6a to 6h in each column.

Line 6j—Show the amount of indirect cost.

Line 6k—Enter the total of amounts on Lines 6i and 6j. For all applications for new grants and continuation grants the total amount in column (5), Line 6k, should be the same as the total amount shown in Section A, Column (g), Line 5. For supplemental grants and changes to grants, the total amount of the increase or decrease as shown in Columns (1)-(4), Line 6k should be the same as the sum of the amounts in Section A, Columns (e) and (f) on Line 5.
Line 7—Enter the estimated amount of income, if any, expected to be generated from this project. Do not add or subtract this amount from the total project amount. Show under the program narrative statement the nature and source of income. The estimated amount of program income may be considered by the federal grantor agency in determining the total amount of the grant.

Section C. Non-Federal Resources

Lines 8-11—Enter amounts of non-Federal resources that will be used on the grant. If in-kind contributions are included, provide a brief explanation on a

Section E. Budget Estimates of Federal Funds Needed for Balance of the Project

Lines 16-19—Enter in Column (a) the same grant program titles shown in

grant. If in-kind contributions are included, provide a brief explanation on a separate sheet.

Column (a)—Enter the program titles identical to Column (a), Section A. A breakdown by function or activity is not necessary.

Column (b)—Enter the contribution to be made by the applicant.

Column (c)—Enter the amount of the State's cash and in-kind contribution if the applicant is not a State or State agency. Applicants which are a State or State agencies should leave this column blank.

Column (d)—Enter the amount of cash and in-kind contributions to be made from all other sources.

Column (e)—Enter totals of Columns (b), (c), and (d).

Line 12—Enter the total for each of Columns (b)-(e). The amount in Column (e) should be equal to the amount on Line 5, Column (f) Section A.

Section D. Forecasted Cash Needs

Line 13—Enter the amount of cash needed by quarter from the grantor agency during the first year.

Line 14—Enter the amount of cash from all other sources needed by quarter during the first year.

Line 15—Enter the totals of amounts on Lines 13 and 14.

Lines 16-19—Enter in Column (a) the same grant program titles shown in Column
(a), Section A. A breakdown by function or activity is not necessary. For new applications and continuation grant applications, enter in the proper columns amounts of Federal funds which will be needed to complete the program or project over the succeeding funding periods (usually in years). This section need not be completed for revisions (amendments, changes, or supplements) to funds for the current year of existing grants.
If more than four lines are needed to list the program titles, submit additional schedules as necessary.

Line 20—Enter the total for each of the Columns (b)-(e). When additional schedules are prepared for this Section, annotate accordingly and show the overall totals on this line.

Section F. Other Budget Information

Line 21—Use this space to explain amounts for individual direct object-class cost categories that may appear to be out of the ordinary or to explain the details as required by the Federal grantor agency.

Line 22—Enter the type of indirect rate (provisional, predetermined, final or fixed) that will be in effect during the funding period, the estimated amount of the base to which the rate is applied, and the total indirect expense.

Line 23—Provide any other explanations or comments deemed necessary.

Applicant Name: Virginia Electric and Power Company Award Number: TA2-149-E

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				$12,596,000	$12,596,000		$25,192,000
2. Budget Period 2				$9,893,300	$9,893,300		$19,786,600
3. Budget Period 3				$5,705,550	$5,705,550		$11,411,100
4. Budget Period 4				$3,763,245	$3,763,245		$7,526,490
5. Budget Period 5				$1,696,000	$1,696,000		$3,392,000
6. Totals				$33,654,095	$33,654,095		$67,308,190

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	$4,143,000	$3,867,600	$3,330,300	$2,996,000	$1,397,000	$15,733,900
b. Fringe Benefits	$0	$0	$0	$0	$0	$0
c. Travel	$0	$0	$0	$0	$0	$0
d. Equipment	$5,064,000	$3,893,000	$5,117,000	$1,827,000	$575,000	$16,476,000
e. Supplies	$15,000	$0	$0	$0	$0	$15,000
f. Contractual	$15,650,000	$11,020,000	$1,920,000	$1,620,000	$1,170,000	$31,380,000
g. Construction	$0	$756,000	$793,800	$833,490	$0	$2,383,290
h. Other	$320,000	$250,000	$250,000	$250,000	$250,000	$1,320,000
i. Total Direct Charges (sum of 6a-6h)	$25,192,000	$19,786,600	$11,411,100	$7,526,490	$3,392,000	$67,308,190
j. Indirect Charges	$0	$0	$0	$0	$0	$0
k. **Totals** (sum of 6i-6j)	$25,192,000	$19,786,600	$11,411,100	$7,526,490	$3,392,000	$67,308,190
7. Program Income						$0

Dominion Energy Virginia | Analytics and Control for Driving Capital Efficiency Project | Community Benefits Plan

FOA and Topic Area: Department of Energy (DOE)– Grid Resilience and Innovation Partnerships (GRIP) | Smart Grid Utility and Industry Competitive Grants

Concept Paper Identification Code: TA2-149-E

Project locations/Congressional Districts
VA-001; VA-002; VA-003; VA-004; VA-005; VA-006; VA-007; VA-008; VA-010; VA-011; NC-001