

**DOCKETED**

<b>Docket Number:</b>	23-ERDD-01
<b>Project Title:</b>	Electric Program Investment Charge (EPIC)
<b>TN #:</b>	251918
<b>Document Title:</b>	LineVision Inc Comments - CEC_EPIC4_ScopingWorkshop
<b>Description:</b>	N/A
<b>Filer:</b>	System
<b>Organization:</b>	LineVision Inc.
<b>Submitter Role:</b>	Public
<b>Submission Date:</b>	8/25/2023 11:48:17 AM
<b>Docketed Date:</b>	8/25/2023

*Comment Received From: LineVision Inc.  
Submitted On: 8/25/2023  
Docket Number: 23-ERDD-01*

**CEC\_EPIC4\_ScopingWorkshop\_LVcomments**

*Additional submitted attachment is included below.*



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August 25, 2023

California Energy Commission (CEC)  
Docket Unit, MS-4  
Docket No. 23-ERDD-01  
715 P Street  
Sacramento, CA 95814

Re: LineVision Comments Re: Grid Modernization Research Scoping Workshop

## **INTRODUCTION:**

LineVision is pleased to provide comments regarding the CEC's recent workshop on proposed grid modernization research funding concepts as part of administering the 2021-2025 Electric Program Investment Charge (EPIC) Program (EPIC 4 Investment Plan)<sup>1</sup>. LineVision is a Grid-Enhancing Technology (GET) company founded in 2018 that has developed an advanced non-contact sensor and analytics platform that continuously monitors the behavior of overhead transmission line conductors<sup>2</sup>, detecting anomalies and issuing real-time alerts on risks, while unlocking as much as 40% additional capacity on existing lines through dynamic line ratings (DLR).

The EPIC 4 Investment Plan supports technology advancements to reduce grid congestion, maintain system reliability, and increase flexibility as more renewables, storage, and distributed energy resources (DER) are added to the grid. GETs solutions like our sensor-based DLR platform can help address the topics under the Grid Modernization research initiative, particularly Topic 10: Technology Demonstrations to Address Grid Congestion in a Decarbonized California.

## **ABOUT LINEVISION:**

LineVision provides utilities with three applications which are all enabled by the company's non-contact equipment, which has no limitations on the line voltage, conductor size, type, or bundle configurations as a light detection and ranging technology (LiDAR) sensor is mounted to the tower structure, eliminating the need to schedule line outages and requiring no live line working techniques. The three solutions are: LineAware, LineRate, and LineHealth, each of which addresses a specific need of operators:

- LineAware provides utility and grid operators with situational awareness, which helps to inform operators with sag and horizontal motion data, triggering alerts on exceedances, a source of wildfire ignition
- LineRate provides Dynamic Line Ratings (DLR) and Ambient Adjusted Ratings (AAR) which increase the capacity on transmission lines

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<sup>1</sup> Lew, Virginia, Anthony Ng, Mike Petouhoff, Jonah Steinbuck, Erik Stokes, and Misa Werner. 2021. The Electric Program Investment Charge Proposed 2021–2025 Investment Plan: EPIC 4 Investment Plan. California Energy Commission. Publication Number: CEC-500-2021-048-CMF. <https://www.energy.ca.gov/publications/2021/electric-program-investment-charge-proposed-2021-2025-investmentplan-epic-4>

<sup>2</sup> Applications are also possible on lower voltage distribution networks



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- LineHealth provides planners and risk management teams with Asset Health Monitoring, which improves maintenance strategies by creating a digital twin to determine conductor health

To date, LineVision has installed over 400 sensors around the world, adding over 1 GW of renewable energy to the grid and helping our utility partners avoid over 1 million metric tons of Co2. Here in California, we are pleased to be working with the Sacramento Municipal Utility District (SMUD), which is using our LineAware and LineRate applications to help evaluate DLR to increase line capacity, reduce hydro curtailment, reduce power imports, and advance SMUD's Zero Carbon Vision.

#### RESPONSES TO 7/21 NOTICE QUESTIONS:

- **What specific research gaps or technology advancements should be prioritized to enhance grid reliability, resiliency, and flexibility to meet SB100 goals?**

Given California's climate goals to have renewable energy and zero-carbon resources supply 100 percent of electric retail sales to end-use customers by 2045, it is critical to pursue options that will help ensure that California ratepayers see the lowest rate-impact possible from this transition. This includes implementing technology solutions that help ensure existing infrastructure is being utilized at its maximum capacity so that we can put more clean electricity on existing assets.

DLR is a technology solution that is able to help enhance grid reliability, resilience and flexibility needed to meet SB100 goals. It should be prioritized because of its ability to quickly alleviate congestion and create critically needed transmission capacity while new projects are put in place over a longer-term timeline as discussed in more detail below. This is critically important as California stands to implement mandates relating to electrification, both of transportation and buildings, while also experiencing record curtailments of wind and solar power; \$647M of clean energy production (at average CA retail rates) was wasted in 2022 as the grid had insufficient capacity to handle the supply.<sup>3</sup> Planning for California's clean energy goals requires focused collaboration among business, technology, and energy leaders—as well as federal, state, and local government agencies and electric utility regulators— if we are to realize an economy powered by carbon-free electricity.

DLR is a technology being widely utilized both in the US and abroad.<sup>4</sup> The Belgium grid operator Elia began implementing dynamic line ratings over a decade ago<sup>5</sup> whereas Energinet in Denmark has seen overline line capacity increased for as much as 90% of the time after combining DLR with a smart algorithm.<sup>6</sup>

Given its ability to enhance grid reliability and resilience while increasing transmission capacity, LineVision believes that DLR is a critical tool to help affordably meet California's SB 100 goals.

- **What target metrics can be used to assess the efficacy of grid modernization technologies in mitigating grid congestion, ensuring system reliability, and enhancing operational flexibility?**

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<sup>3</sup> <http://www.caiso.com/informed/Pages/ManagingOversupply.aspx>

<sup>4</sup> <https://watt-transmission.org/>

<sup>5</sup> <https://www.elia.be/en/infrastructure-and-projects/our-infrastructure/dynamic-line-rating#:~:text=By%20taking%20into%20account%20local,capacity%20of%20the%20equipped%20lines>

<sup>6</sup> <https://www.smart-energy.com/industry-sectors/energy-grid-management/energinets-dynamic-line-rating-improves-overhead-capacity-by-up-to-30/>



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Metrics regarding the integration of low cost, clean generation enabled in the shortest amount of time and at lower cost than traditional upgrades should be examined. DLR makes transmission capacity available at an average unit cost of less than 1/20th of traditional line construction or reconductoring costs<sup>7</sup>, and can be operational in a matter of months.

The need to implement congestion relief solutions like GETs is key as the last two years have been record years for transmission congestion. Consulting firm Grid Strategies LLC recently released a report estimating that costs to consumers from congestion on the U.S. power grid jumped 56% in 2022 to an estimated \$20.8 billion from \$13.3 billion the year before; the key driver of these increased costs being the failure of transmission expansion to keep up with the growth of low-cost renewable energy. Based on research by the Brattle Group, GETs could reduce congestion by 40%, a critical benefit to addressing a near term challenge on the existing grid as new transmission projects are pursued.<sup>8</sup>

DLR can also be a critical tool to improve grid reliability since DLR sensors can evaluate conductor health and detect adverse phenomena such as conductor creep/elongation, excessive sag, blowout, conductor fatigue, ice accretion and wildfire risk. When DLR systems are integrated into utility operations, real-time awareness can be routed directly into the utility's EMS system. In addition to this public benefit by way of consumer savings and enhanced grid resilience, DLR technology also has a transformative impact as once a utility has put forward the one-time engineering effort of integrating a DLR system, the barrier to entry drops for the deployment of future DLR projects, allowing for high repeatability at an even faster timeline.

Lastly, DLR is key to enhancing the operational flexibility of the grid due to its ability to create additional capacity on surrounding lines in the case of an unexpected event/grid outage, including a PSPS event. For example, in a situation when the grid is in an irregular operating state, whether due to construction, maintenance, and/or unplanned outages, use of DLR can provide additional capacity on existing transmission pathways enabling operating flexibility that will help mitigate some of the impacts to the grid and reduce the amount of required generation re-dispatch needed to alleviate the short-term constraint.

- **Are there developed technologies or lessons learned and best practices from other regions including internationally that could be applied to grid modernization efforts in California?**

New York is another state with similarly bold climate goals through the State's Climate Leadership and Community Protection Act (CLCPA), which requires (1) a 40 percent reduction in GHG emissions from 1990 levels by 2030 and an 85 percent reduction by 2050; (2) a renewable electric generation target of 70 percent by 2030 and a 100 percent emissions-free electric supply by 2040; and (3) the addition of 9 Gigawatts (GW) of offshore wind generation to the energy portfolio by 2035.<sup>9</sup> New York is also looking to identify the investments needed to meet CLCPA goals, including the technology applications that may present low-cost solutions to traditional grid investments.

As part of the 2020-2021 enacted State Budget, New York State announced passage of the Accelerated Renewable Energy Growth and Community Benefit Act (Act). The Act instructed the State to conduct a Power Grid Study to inform transmission and distribution system investments that will be necessary to

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<sup>7</sup> Comments of the Clean Energy Entities; Implementation of Dynamic Line Ratings; AD22-5; April 25, 2022

<sup>8</sup><https://watt-transmission.org/wp-content/uploads/2023/04/Building-a-Better-Grid-How-Grid-Enhancing-Technologies-Complement-Transmission-Buildouts.pdf>

<sup>9</sup> <https://climate.ny.gov/>



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achieve the clean energy goals of the CLCPA. As part of the Power Grid Study process, the New York Public Service Commission noted that there are several well-developed transmission technologies, including DLR, that the Utilities should consider applying when designing local transmission and distribution investments. The Commission further noted that DLR has such a significant track record in other jurisdictions that further research may not be necessary in advance of widespread deployment.<sup>10</sup>

National Grid will be upgrading over 1,000 circuit miles of transmission across its Upstate NY service area to unbundle current and planned renewable generation and ensure delivery to customers; DLR technology is one of the key tools being utilized by National Grid to achieve this goal, including through projects with LineVision.<sup>11</sup>

- **What collaboration opportunities exist between stakeholders, utilities, technology providers, research institutions, and government agencies to accelerate grid modernization research and implementation?**

California faces an unprecedented need to expand its transmission grid. Experts at Princeton forecast that the state will need to triple its grid capacity by 2050.<sup>12</sup> While CAISO recently approved \$7.3 billion in transmission investments for the next 10 years, it is estimated that they will need to invest over \$30 billion in the next 20 years.<sup>13</sup> There is a new way to approach transmission planning so as to ensure a sequential way of transmission expansion that prioritizes grid optimization first in advance of reinforcement and expansion. GETs like DLR enhance the value of transmission throughout all stages of project development, including deployment on new lines. While new transmission is needed to connect generation resources in remote regions to load centers, DLR can be used to expedite the online date of many projects as new transmission is built while also providing future benefits such as reducing congestion and expanding flexible capacity.

Beyond their key near term ability to address existing congestion, GETs like DLR are also valuable during the construction of new transmission projects (by preventing congestion caused by transmission outages that occur while interconnecting new projects), and after the newly developed transmission projects are put in service. Research by the Brattle Group found that GETs could increase the utilization of new transmission lines by 15-22%.<sup>14</sup>

- **Are there other considerations or requirements that should be considered for future funding opportunities?**

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<sup>10</sup> State of New York Public Service Commission; Case 20-E-0197; Order on Power Grid Study Recommendations; Jan 20, 2022

<sup>11</sup><https://www.prnewswire.com/news-releases/national-grid-and-linevision-deploy-largest-dynamic-line-rating-project-in-the-united-states-301653906.html>

<sup>12</sup> <https://netzeroamerica.princeton.edu/?explorer=year&state=national&table=2020&limit=200>

<sup>13</sup> <http://www.caiso.com/InitiativeDocuments/20-YearTransmissionOutlook-May2022.pdf>

<sup>14</sup><https://www.brattle.com/wp-content/uploads/2023/04/Building-a-Better-Grid-How-Grid-Enhancing-Technologies-Complement-Transmission-Buildouts.pdf>



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California also has ambitious goals to develop offshore wind (OSW) resources, including deploying up to 5,000 megawatts (MW) by 2030 and 25,000 MW of offshore wind by 2045 — enough electricity to power 3.75 million homes initially, with a goal of powering 25 million homes by 2050.<sup>15</sup>

The ability for OSW resources to play a critical role in future generation scenarios is also a prominent use case for the utilization of DLR. Of the 10,000 MW of offshore wind in the SB100 starting point scenario – 6,000 MW offshore wind resources in the Central Coast area can be interconnected to the existing 500kV system in the Diablo/Morro Bay Area. As noted in CAISO’s 20 year outlook, the 4,000 MW of offshore wind resources in the North Coast area will require some significant 500kV and HVDC facilities to interconnect to the existing 500 kV system to integrate the offshore wind into the CAISO grid, as the transmission system in the north coast area is predominantly 115 kV and 60 kV.

Given that wind speed is the most significant factor affecting line capacity, DLR can play a critical role in ensuring that the new OSW generation in both the Central and North Coast areas is maximized on the infrastructure that is needed to connect the offshore generation to the transmission grid. LineVision’s LineRate solution is being utilized in the United Kingdom to help integrate OSW resources that had been experiencing curtailments due to limited onshore capacity. Operationalizing LineVision’s DLR National Grid is projected to unlock 600 MW of additional capacity a year, enough to power more than 500,000 homes as well as reduce constraint payments (where the electricity system operator pays generators to stop producing power to avoid overloading the transmission system) - saving £1.4 million in constraint costs a year. By integrating more offshore wind, this project also reduces over 700k metric tons of CO2 per year.<sup>16</sup>

## CONCLUSION

LineVision appreciates the opportunity to highlight the key role of GETs like DLR as the CEC considers options for proposed grid modernization research funding concepts as part of the EPIC 4 Investment Plan. Thank you for your consideration of these comments.

Sincerely,

Hilary Pearson, Vice President of Policy & External Affairs

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<sup>15</sup><https://www.energy.ca.gov/news/2022-08/cec-adopts-historic-california-offshore-wind-goals-enough-power-upwards-25>

<sup>16</sup> <https://www.linevisioninc.com/resources/national-grid-uk-deploys-linevisions-dlr>



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