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ComEd Air Quality Monitoring Pilot Executive Summary

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Prepared By
Electric Power Engineers, RHP Risk Management Inc., and the University of Illinois Chicago School of Public Health

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For more information on this project, contact Customer.Innovation@ComEd.com.

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Executive Summary

The ComEd Air Quality Monitoring (AQM) Pilot, also called the "Hyperlocal Air Quality Assessment" (HAQA), aimed to gather localized air pollutant concentration data in select Equity Investment Eligible Communities (EIECs) across Chicago. A collective of academic researchers, technology vendors, and air quality experts was selected by a competitive RFP to collect hyperlocal, granular air quality measurements in Pilsen, Little Village, and the Southeast Side of Chicago. Using both mobile and stationary monitoring methods, the pilot project built the infrastructure to establish baseline air quality conditions and collected short-term air quality data to support ComEd's Beneficial Electrification (BE) programs, enabling future evaluation of the environmental and public health benefits associated with continued electrification investments. The pilot's objectives included increasing the resolution of air quality measurements, raising awareness of the impact of beneficial electrification on air quality, and potentially integrating air quality monitoring support into ComEd programs to assess the impact of ComEd's beneficial electrification on urban air quality.

To accomplish these goals, the pilot deployed a comprehensive hyperlocal monitoring strategy, combining i) Aclima's mobile monitoring (February – May 2025) for Fine Particulate Matter (PM2.5), Ozone (O_3), Nitrogen Dioxide (NO_2), Methane (CH_4), Carbon Monoxide (CO), Carbon Dioxide (CO_2), Black Carbon (BC), and Total Volatile Organic Compounds (TVOCs) across nearly 400 linear miles of roadway; and ii) a neighborhood-scale stationary sensor network of 69 Clarity Node-S sensors for the measurement of PM2.5 and NO_2 along with supplemental black carbon measurements at six locations. The air monitoring network design and data collection plans were further enhanced through extensive community collaboration with six environmental justice organizations, ensuring that lived-in experience and local knowledge were incorporated into the final designs. Together, this multimodal framework created a robust scientific foundation for understanding spatial and temporal pollution patterns within EIECs and laid the groundwork for multi-year tracking of how beneficial electrification, such as fleet electrification, building decarbonization, and reduction of fossil-fuel combustion, may improve air quality over time.

Beyond data collection, the pilot demonstrated a replicable model for integrating environmental measurement into utility program planning. It established a durable and robust air monitoring infrastructure that will continue to operate through 2030, enabling long-term evaluation of emissions reductions attributable to BE investments. The pilot also strengthened community capacity in multiple domains that include i) improved air quality knowledge in community partner service areas through participatory mapping of local stationary and mobile sources of air pollution on the West and Southeast Sides of Chicago; ii) training on air quality, air pollutants and their sources, health effects, and monitoring techniques; and iii) training on ComEd's beneficial electrification programs.

Key Findings

The following key findings summarize the major outcomes of the ComEd AQM Pilot. They reflect the project's technical performance, community engagement results, preliminary environmental insights, and the foundational value created for future BE program planning. These findings represent what the pilot achieved within its one-year timeframe and what the established infrastructure can support in future years.

1. The pilot successfully established a robust, neighborhood-scale monitoring infrastructure across EIECs.

   The project deployed a scientifically rigorous combination of Aclima's mobile platform and a stationary network of 69 Clarity PM2.5/NO_2 sensors, supplemented by six black carbon sensors. The stationary network was designed by UICSPH to meet EPA neighborhood-scale criteria and incorporated community input for siting. Together, the study methods produced hyperlocal, granular environmental measurements successfully, forming the foundation for multi-season and multi-year tracking of pollutant trends using Clarity sensors.

2. Community engagement significantly strengthened sensor siting and interpretation.

   Six community-based environmental justice organizations (CBOs) across the West and Southeast Sides of Chicago collaborated closely with UICSPH and the project team. UICSPH and CBOs conducted participatory mapping, identifying local air pollution sources, sensitive population locations (including children and the elderly), roads with heavy traffic and truck activity, and truck idling locations to guide Aclima's interpretation of the mobile monitoring data collected. The participatory mapping data, along with other publicly available air quality data, also supported Clarity sensor placements on light poles in a series of community meetings. The strong community partnership facilitated the incorporation of community knowledge into project design, increased local awareness of the connections between electrification and air quality, and positioned CBOs to utilize pilot results for advocacy and community education.

3. Mobile monitoring data represented a validated three-month baseline (February 24 to May 23, 2025) and provides a statistically robust estimate of typical hyperlocal pollution levels.

   Aclima's mobile monitoring identified combustion-related emissions with short-term spatial patterns, providing insights into locations where targeted electrification or policy efforts, such as fleet, transit, or industrial electrification, or anti-idling interventions, may yield the greatest improvements.

4. Stationary sensors confirmed the feasibility of continuous hyperlocal monitoring but require multi-season data for full interpretation.

   The preliminary two-month PM2.5 and NO_2 Clarity dataset demonstrated typical urban diurnal patterns and detectable spatial variability. However, due to short-term data collection (limited to two months), the representativeness of the stationary Clarity Node-S sensor data and results for PM2.5 and NO_2 (and also for Black Carbon) presented in this report for the ComEd study communities in the West and Southeast Sides of Chicago is not yet fully known. With a five-year subscription (2025–2030), the Clarity network is expected to generate full-year and multi-year datasets necessary for evaluating seasonal pollutant patterns temporally and spatially, and the benefits of electrification and other policy interventions.

The ComEd Beneficial Electrification Program is funded in compliance with state law.

5. Quality assurance and data reliability were strong across mobile and stationary platforms.

   Both monitoring components underwent rigorous calibration, quality assurance, and quality control (QA/QC) procedures, as well as data validation processes. Aclima applied pre-/post- calibration, excluded self-pollution, and used multi-pass aggregation to ensure representative estimates. The intra-sensor performance of Clarity sensors was evaluated in a four- to six-week parking lot collocation study. The global calibration models and device-level quality assurance (QA) are assessed by Clarity on a routine basis. This ensures that the data streams supporting BE planning are scientifically defensible.

6. The pilot demonstrated clear environmental, social, and operational value for future BE-related decision-making.

   Despite limited duration, the monitoring results and methodology developed in this pilot can be used to track and assess the impact of BE programs and policies in the future. Community organizations reported an increased understanding of the benefits of electrification and intend to utilize this knowledge for advocacy, outreach, and environmental justice initiatives. The monitoring infrastructure and community partnerships established through the pilot provide long-term value for improving public health, engaging residents, and informing targeted BE investments.

Recommendations

The following recommendations build directly upon the findings of the ComEd AQM Pilot and identify opportunities for ComEd to leverage hyperlocal air quality data to strengthen BE programs, enhance community partnerships, and support data-driven planning. While the pilot's short monitoring window limits the ability to draw conclusive statements about seasonal air quality conditions, the infrastructure, methods, and community relationships established through the project create a strong foundation for ongoing data collection and analysis.

1. Use AQM data to establish baselines and support multi-year evaluation of BE program impacts.

   Future monitoring should focus on collecting full-year and multi-year datasets, particularly in areas where electrification or fleet transition is anticipated. Indoor air quality monitoring should target households likely to adopt electrification measures, with pre- and post-intervention comparisons or control groups. Long-duration datasets will allow ComEd to quantify emissions reductions attributable to BE and separate program impacts from seasonal variability.

2. Leverage expanded monitoring to identify and address pollution hot spots suitable for electrification interventions.

   The pilot results and forthcoming 277 Clarity sensor data from the Chicago Air Sensor Network can be used to identify priority corridors and neighborhoods with elevated pollution levels. Additional targeted monitoring could be implemented around truck routes, industrial corridors, fleet depots, and sensitive receptors, which will support future evaluation of heavy-duty electrification, charging infrastructure siting, and community-focused electrification programs with maximum benefit.

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3. Integrate AQM results into targeted BE programs, incentives, and community outreach strategies.

   ComEd can use pilot-area pollutant data to prioritize electrification in communities with persistent air quality challenges, tailoring incentives for fleets, commercial vehicles, or residential programs based on local needs. Overlaying data from the EPA's EJScreen, the Illinois EIEC map, the CDPH Cumulative Environmental Justice Index map, and AQM data will support equitable deployment.

4. Apply best practices in future AQM deployments, including seasonality, sensor selection, and QA/QC enhancements.

   If ComEd were to scale the AQM pilot to cover a larger or different geography or a longer study period, several best practices developed in this pilot study should be integrated into the effort, based on a review of other AQM programs around the country. Site selection should integrate EPA monitoring criteria, community input, and environmental justice considerations. Continued collocation with Federal Reference Monitors (FRMs) and Federal Equivalent Monitors (FEMs) will further validate sensor performance and strengthen data quality for policy development and programmatic use.

5. Consider complementary analytics-based approaches to quantify BE benefits alongside environmental monitoring.

   Because short-term AQM datasets can be influenced by meteorology, ComEd may supplement air monitoring data with emissions and air quality modeling data, avoided health-impact calculations, energy consumption data, and cost-benefit analysis. These tools can further quantify program benefits and help inform BE program design and Evaluation, Measurement, and Verification (EM&V).

6. Diversify funding sources and partnerships to sustain and expand hyperlocal monitoring.

   Federal and state programs, including Climate Pollution Reduction Grants (CPRG), Congestion Mitigation and Air Quality Improvement (CMAQ), AmeriCorps Climate Corps, and city-led AQM initiatives, offer opportunities to extend monitoring, expand scope, or support program integration. Leveraging partnerships with UICSPH, CDPH, UIUC, and community organizations can amplify impact while reducing overall program costs.

7. Continue and deepen community engagement to support BE adoption and equitable outcomes.

   CBOs demonstrated strong interest in electrification programs and requested hands-on training and continued partnership. ComEd should expand engagement in EIECs, offer technology demonstrations, and incorporate community concerns into BE design. Building on pilot relationships will strengthen trust, improve program uptake and expansion, and ensure that electrification benefits are provided to historically underserved neighborhoods, promoting health and equity.

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